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THE FISHES OF MARYLAND

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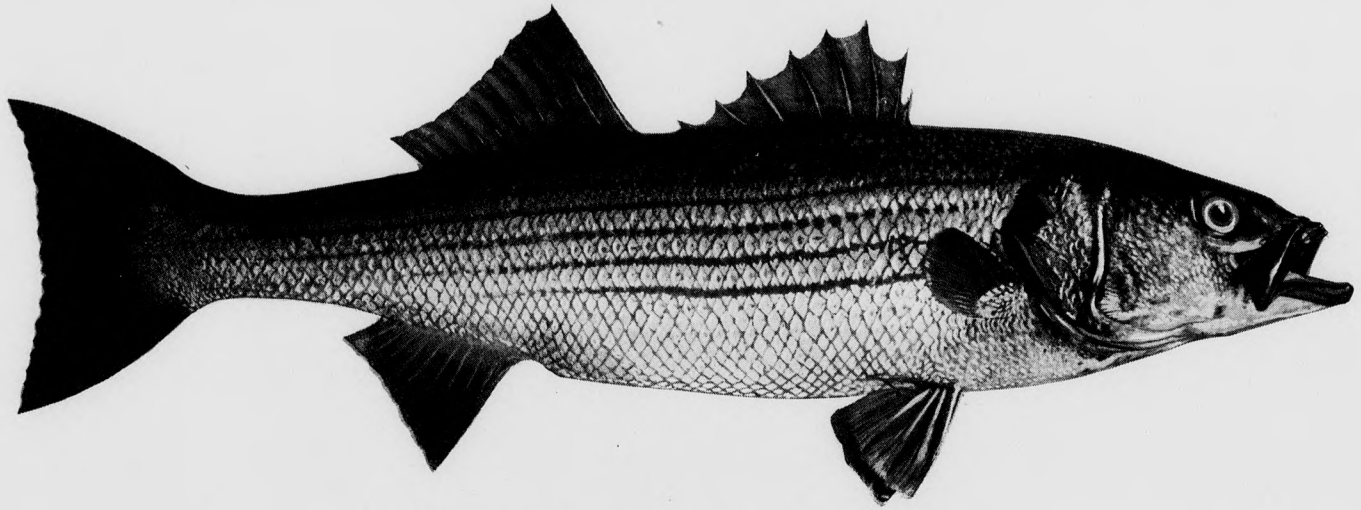

THE STRIPED BASS OR ROCK FISH—(Roccus lineatus)

The FISHES *of* MARYLAND

BY

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PREFACE

In the past few years there has been a wider interest in conservation work in Maryland than ever before. Under this broad subject come the aquatic resources of the Chesapeake Bay—fish, shell fish and crustacea. Probably more people in Maryland are interested in fin fish, from both a commercial and a sporting standpoint, than in any of the other water products, and for sometime there has been an apparent need of a publication setting forth the species, describing them and telling of their distribution, habits and other pertinent facts.

Because of his long service and experience with the fisheries and fishes of Maryland, R. V. Truitt, Professor of Aquiculture at the University of Maryland, a student and extensive collector of aquatic forms, was requested to prepare the data for this work. Dr. Truitt had full coöperation and the assistance of Barton A. Bean, Assistant Curator of Fishes, United States National Museum, and Henry W. Fowler, of the Academy of Natural Sciences of Philadelphia, both of whom have done extensive collecting in Maryland's waters.

The Maryland Conservation Department considers it a privilege to publish this valuable treatise.

SWEPSON EARLE, *Commissioner.*

THE BIOLOGY OF THE FISH

General Considerations

Collecting Maryland's fishes has not been the result of intensive effort over a short period of time, nor has it been a special problem. While on official missions, here and there in the State, a week of vacation on the Eastern Shore, or a few days in the mountains of Western Maryland, our diversified interest in fishes prompted the collecting of equally diversified forms, which suggested that with concerted effort we could add to the available collections the greater number of those fishes not yet recorded as found in the Old Line State. During the past five years the work has been consummated so far as is within our power, with the collection of two hundred and twenty-eight species. It is highly probable that several other species will be found in Maryland's waters, especially along the coastal strip in Worcester County.

In scope, the data we are submitting is based on fishes collected in Maryland only, though a general treatise on fishes, their habits, adaptation, colors and distribution is set forth. While intended primarily to furnish information to men and women desiring to become well informed concerning local fishes and their peculiarities, it is more than a popular treatise; it is in part technical. In a publication of this kind it is impossible, in fact not desirable, to set forth all the characters, even though they are the products of nature herself, necessary to distinguish the various species. That is the work of taxonomists and has been done most admirably by such authorities as Girard, Gill, Jordan, Goode, Bean and others in their various papers based upon the studies of fish-like vertebrates found in American waters. We limit ourselves, then, to a general discussion of fishes followed by the more technical facts concerned with local forms.

We would recall that the great staple food product of the water is fish. Turtles, molluscs and other denizens of water areas are consumed locally, according to their presence, but fishes are used practically everywhere. The prehistory of man gives evidence of the strongest nature that he throve best where fishes were most abundant. Since the earliest development of civilization they have been a part of man's diet and bid fair to continue thus unless his own ruthlessness completely destroys them. These records are set forth in the hope of arousing some little interest in the finny creatures, concerning which so little is known in general.

America, blessed with plenty, has been very backward in her aquatic interests. European nations and Japan have established

colleges of fisheries to study, conserve and rehabilitate their over-taxed and nearly exhausted waters, and with telling effect. Here we are still "trusting to Providence" though we are approaching the end with amazing rapidity. Why should our fish culture be in such a backward state when compared with the many other phases of animal husbandry in which we excel? Why should we be content by merely hatching and liberating young fish with uncertain protection, and, in many cases, in foul waters, when we have improved only one or two breeds, as gold fish and commercial carp? Why should we not know their pasturage and how to encourage it, the big problem in rearing animals of any type? These and many other problems suggest themselves throughout, but ours must be a limited work, though we hope that we may offer directly or indirectly some food for thought.

Distribution

Approximately fifteen thousand species of living fishes have been named, while the earth's deposits are yielding constantly forms that once competed for an existence but were unable to survive. So diversified are the characters of fishes that there are over three hundred family groups which range in size from one to hundreds of species. Fossil remains indicate that there has been great instability in the fish groups; those having great numbers of species have not always been thus, likewise, those now represented by a single species might once have been members of a vast family.

While fishes are dispersed to every quarter of the world and are found in every persistent body of water throughout, by far the greatest number is found in and around North America, (distribution for Maryland is given under that head) there being represented about one-fifth of the total of known species. The greater number of American species are tropical. No strict and fast lines of distribution can be drawn for fishes. However, we recognize certain types of fishes according to their ranges, which may be defined. The two general groups are the Marine and the Fresh-water Fishes, the names of which are indicative of the general nature of the environments. The fresh-water fishes are much less diversified than the salt-water forms, approximately two-fifths of the former belonging to the minnow group, or Cyprinidae. Most of Maryland's species are indigenous, as may be gleaned from the appended list.

In the marine forms the littoral fishes, those from the zones near the shores and harbors where life in the sea is richest, hold the preponderance of numbers. These types are more highly specialized in their individual groups, no doubt due to the greater number of varying conditions and the severe competition in the habitats. Since littoral forms occupy coastal areas their geographical positions are rather

marked, though they greatly overlap within themselves. Roughly they occupy the areas along the longitudes of the continental shore lines, four in number. Beginning at the north in any one of these realms, we recognize, according to temperatures, the Arctic fauna, almost identical in all four of the areas, the Subarctic, Temperate, Sub-tropical, Tropical or Equatorial, South-Temperate and Antarctic, the last named fauna, like that of the Arctic, being practically constant through the four areas. Distribution in each of the zones is modified, like it is elsewhere in the sea, by currents and barriers causing genera and species markedly different, though each isothermal unit is represented throughout by the same general types. Quite fine distinctions are drawn in the divisions set forth for littoral distribution, and because of certain over-lapping on the one hand or absence of forms on the other, further and less general divisions, minor faunae are necessary. For instance, beginning in the Arctic of the east Pacific, we have, in addition to the Arctic or northernmost area, the Aleutian, the Sitkan, the Californian, San Diegan and others southward, embracing the zones implied by the name. On our east coast we have the Greenlandic, the New England, the Virginian, etc., with a recognized total of fifty minor faunae.

Shading from the littoral fishes into the more grotesque and uncommon forms of the deep-sea are the pelagic types, which range in wide limits of temperature near the surface. Typical of this group is the mackerel family and allied forms which are so widely dispersed over the sea. The centers of distribution for pelagic fishes are uncertain because of the extreme dispersal, though each group has its special breeding place. Efforts of science are now being directed, in a great measure through intensive tagging practice, to solve the problems of migration and distribution of fishes.

Living in the deep sea below the vegetable and light plane, and, indeed, below the thermocline, is a vast array of fishes as variable in size as in form, many of which are grotesque in appearance and most peculiarly adapted to their environments. Distributed largely in a vertical line below the pelagic belt we find these forms at great depths as in the case of *Cyclothone elongata,* which has been taken fifteen thousand feet below the surface.

There are good reasons to believe that the bassalians have become modified, in the course of their survival, from the shore types, largely through degeneration of bones and muscles. Some have large but poorly equipped eyes, others are blind, while some have developed to a high degree luminous areas for offensive as well as defensive purposes. The deep-sea forms do not normally occupy surface positions even during mating or seasons of reproduction. From the semi-bathybial

strata, however, occasional forms extend upward to the surface and, as in the case of the sea robin, *Prionotus carolinus,* along Maryland's shores, it may be that a littoral species ranges to the nearer depths. Again it should be noted that absolute lines of demarcation cannot be drawn in fish ranges.

There are a few species of fishes which are normally both marine and fresh water. These are found in creeks and along tide-water areas where the water concentration is subject to change and the habit seems to be a recent, in the geological sense, adaptation. On the other hand, vast numbers of marine forms, including even some semi-bathybial forms from depths of fifty fathoms, sense out favorable spawning grounds in shallow fresh water streams and proceed thither to deposit their eggs for development. In such a case long periods of the juvenile life may be spent in the up-land streams before the seaward journey begins. The anadromous lamprey eel, *Petromyzon marinus,* found so abundantly in the streams of Southern and Western Maryland, illustrates the point in question. When the bright days of spring arrive and begin to warm the streams, this denizen of the ocean moves up into the shallows, where its eggs are deposited. In reaching the head waters of Paint Branch, a clear stream tributary to the Potomac River, at and above College Park, we have observed them climb a three foot concrete dam and proceed only half submerged up shallow rills over stone and rock beds until their bodies were beaten, torn and exhausted. But with complete success for the eggs were deposited a few days later and the larval eels appeared. From early June until the following mid-winter the larvae grow and then transform into the juveniles which start their migration to the sea.

Contrarywise, the common eel, *Anguilla rostrata,* lives normally in fresh water, but leaves Maryland's confines and goes to the open sea in order to reproduce, choosing, in common with others of this same species from our eastern coast and from Europe as well, the general vicinity of Bermuda. After the early developmental period has passed these catadromous creatures obey an impulse which directs them, apparently, to the abodes of their parents. The habits of this species and its breeding areas have but recently been established, the result of a most thorough and painstaking scientific investigation by Dr. Johannes Schmidt of Denmark.

With it all, Maryland's two hundred and twenty-eight recorded forms* represent, in their general aspects, a workable cross section of the distribution of fishes. The fresh-water members are not local in any

* Species checked with the collection in the United States National Museum, the Academy of Natural Sciences of Philadelphia and the Department on Zoology and Aquiculture of the University of Maryland.

sense. Rather, indigenous here in Maryland are forms which may be traced over broad areas, north, south and west. The marine forms, likewise, are cosmopolitan and represent the depths, the semi-bathybial, the pelagic and the shore forms as well as the anadromous and catadromous members.

Fishes and Their Organization

At this point we should understand just what a fish is. Not uncommonly whales are seen along the coast of Worcester County, several of which have become stranded on the beach in late years. Occasionally whales have been sighted in the lower part of the Chesapeake Bay. These leviathans, entirely aquatic, are not fishes as would likely be suspected, though the common environment has effected changes which give them marked similarities. They are mammals, that group of animals characterized by the presence of hair in some stage of their development and by the production of milk upon which the young are nourished after birth. Not so with fishes.

Fishes, as such, are more or less easily recognized, even the unusual ones. However, a few forms ordinarily adjudged fishes are not fishes at all, though allied to them in the lower extreme of the vertebrates, or animals with an axial notochord at some period of their existence. The true fishes belong to a class, Pisces, whose respiratory organs are gills. These gills are covered by a bony flap-like operculum. Usually there is a dermal exoskeleton of scales or bony plates which furnish a protective covering for the body, while the endoskeleton is of true bone or bone and cartilage. An air bladder is usually present. Perch, minnows, pike, trout and similar forms are true fishes.

Resembling the true fishes in external form and habits are the elasmobranchs, class Elasmobranchii, or sharks, dog-fish and skates. This group differs from the above mentioned by a distinct arrangement of skeletal parts, by the absence of membrane-bones, air bladder and true scales. Representative elasmobranchs of Maryland are the hammerhead shark, (*Sphyrna zygaena*), the saw fish, (*Pristis pectinatus*) and the sting ray, (*Dasyatis sabina*).

The third group of animals known commonly as fishes is class Cyclostomata, the cyclostomes. These fishes have a striking resemblance to eels though differing markedly from them, as well as other fishes, in that the jaws do not develop and there are no lateral appendages. There is only one olfactory pit and the skeleton or notochord persists throughout life. Representative in our waters are the lampreys, *Petromyzon* being especially abundant.

All three of the classes named are abundantly represented in Maryland waters though, as seen in the table that follows, by far the greatest number of the so-called fishes are true fishes. Differences

equally great and others far more in detail are necessary for a clear understanding of classification. Modification and specialization have taken place in a gradual series of perfections from the lowly lamprey to the highly evolved perch group, affecting every system: nervous, circulatory, digestive, excretory, reproductive and skeletal. While most of our fishes are not difficult of identification, many of them are greatly so. The characters separating certain closely related forms are so hard to distinguish that the problems are real and well nigh insurmountable except by students skilled in taxonomic zoology. However, most of the game and food species and the more common members fall into the groups which are less difficult of identification, as will be observed from the appended key.

In order that the complexity of the fish organization might be better understood herewith is set forth the features, both external and internal, of a common fresh water fish, the yellow perch—*Perca flavescens*. This fish, indigenous here and found throughout the northeastern part of the United States, west to the Mississippi, is about ten inches in length when fully grown. The body is divisible into head, trunk and tail. It has two dorsal fins, a caudal fin, a single median anal fin, two ventral fins, and two lateral pectoral fins.

A *mouth* with well developed and prominent tooth-set jaws appears on the forward aspect of the head. Occupying nearly a lateral position, slightly dorsal, on either side of the head is an *eye,* in front and slightly below which is a *nasal aperature.* Back of and below the eyes are the opercula or gill-covers.

Fishes represent the maximum efficiency in animal *stream-lining.* For the most part their bodies are spindle-shape and with extremely smooth surfaces to offer little resistance as they traverse the dense medium in which they live. While the spindle-shaped body of trout or perch, for instance, is the prevailing form, many variations have crept in as in the case of eels, which are thread or snake-like, and butter fishes, which are greatly compressed. In the flounder, depression has gone on to such an extent as to necessitate the placing of both eyes on one side of the body and the animal swims on its side, the changes taking place largely after hatching. The shape and form of a fish's body is closely related to its habitat, thus we find the eel in and around rocks, weeded areas and in holes; the flat fishes near the bottom or in crevices, and the fusiform members, in which resistance is so greatly reduced, in the open waters, though many exceptions may be noted throughout.

Distances from the surface are gauged by *lateral lines,* one on each side of the body extending forward-backward, usually in the upper half, sensitive to pressure. It is not improbable that these lines

function in an auditory capacity and at the same time register disturbances in the water, such as the approach of an enemy or the like. A number of common fishes do not have lateral lines, among them the herring and the marine mullets found in Maryland waters.

Organs common to higher animals are found in fishes and, indeed, a great degree of perfection is noted in them, especially when compared with creatures or classes immediately below. The *ear,* an internal chamber, lies near the brain and has no opening to the exterior. In it are otoliths, or ear stones, which function, apparently, in determining the equilibrium so necessary for an animal which normally moves in two planes. It is highly probable that the ear shares with the lateral line the recording and interpretation of sounds and water disturbances. *Nostrils* are present as previously pointed out, but the part they play in the fish make-up is not clearly understood. Though external openings are present the nasal pits do not extend back to the throat as in higher forms, and no apparent assistance is rendered to respiration. There is some detection of odor in fishes, but this sense is not independently and acutely developed. Likewise the *eyes.* While well developed cornea, lens and pupils are present, it is doubtful that vision, although acute within limits, has advanced to a degree corresponding to the high position in the animal kingdom held by fishes. Of particular interest in connection with the eye of fishes is the fact that there is not a fixed point of focus, and a series of eclipses is not necessary for the recording of images. To change focal length the lens is moved nearer or further from the pupil. Fishes do not see objects, even in motion, at great distances.

Drum, catfishes and still others have well developed *tactile organs,* in the form of barbels protruding, tenacle-like, from the general vicinity of the mouth. These organs are especially sensitive, and are used in "feeling out" strange objects, in search of food and in explorations.

In fishes *taste* is seated in the mucous membrane of the mouth and offers a fair sense of discrimination in the selection of food, though not particularly well developed. This membrane seems to be sensitive well out to the edges of the mouth and not confined to the tongue and mouth cavity.

Probably the most conspicuous external organs of fishes are the *fins,* which appendages vary in species and are either paired or single, the latter being in a vertical position. The fins are composed of non-scaled membranes supported by cartilaginous or bony rods and rays, through the movement of which locomotion is accomplished. The high speed which most fishes are able to attain bespeaks the efficiency of these modified appendages, the most powerful of which is that on the posterior end, the *caudal fin.* The *pectoral fins* (see fig. I) are located one on either side of the body and correspond to the fore legs of

Fig. 1.—Diagrammatic Sketch of a Yellow Perch

quadrupeds, while the *ventral fins* lie posterior and below them representing the hind legs of a quadruped. The uppermost fin is called the *dorsal fin* and oftimes, as in figure, is divided into two or even three parts appearing to be distinct and not uncommonly termed "adipose fins." The remaining vertical member is known as the *anal fin* and, like the dorsal, it may be composed of spines, rays and finlets. Either or all of the paired fins may be absent, the pectorals being much more persistent throughout the fish group. The point of attachment of the paired fins varies in different forms, the ventrals of sharks being located on the abdomen, of the croaker on the thorax while, on the common toad fish, they are under the throat. The location of the pectorals, in a way, depends upon the insertion of the ventrals. When the latter occupy a posterior position the former are attached well ventrad, but when the ventrals are jugular the pectorals are well up toward the lateral lines. Great variations occur in shape, size, division, position and other features of the fins of different species, thereby offering characters which serve in a big measure for classification.

Fig. 1.—Diagrammatic Sketch of a Yellow Perch

Propulsion of a fish, for the most part, is derived from the posterior part of the body and the caudal fin due to a series or alternate contractions of the strong muscles on the sides of the trunk running to the tail extremes. The tail moves to and fro not unlike an oar blade being used in sculling a boat, while the body as a flattened "S" bends from side to side, the fin describing a figure eight (8). The paired fins and remaining verticals contribute but little, if any, to the locomotion of fishes except indirectly through balancing and directing. The muscles controlling them are comparatively poorly developed though sufficiently so for their purpose which in the main is that of directing travel. The caudal fin or rudder controls largely the directional stability, while the vertical fins might be thought of as the "center-board" of the fish craft, caring for lateral stability; the paired fins correspond to the ailerons of an aeroplane, having the advantage, however, through offering their flat surfaces to the water, of acting as brakes in bringing the body to a stand-still.

Fishes breathe by means of *gills* which represent the greatest departure in adaptation of the animals to an aquatic environment. Lifting the opercula, in true fishes, four pairs of red fringe-like bodies, the gills, are exposed. On either side of the throat just behind the mouth cavity there are four more or less crescent-shaped bones, the *gill-arches,* each of which bears two gill-processes. Being richly supplied with blood the gills offer surface for gas exchanges; oxygen, dissolved in water, being taken in and distributed over the body, while the blood is relieved of its carbonic acid gas charge which passes directly into the water. Breathing in fishes, as in higher forms, must be carried on constantly, the water passing through the mouth then on back between

the lamina of the gills and out the opercular opening to the exterior. Currents are set up by movements of the jaws, tongue, and opercula, assisted in some cases by the paired fins. Cyclostomes and some elasmobranchs have a breathing pore, the spiracle, through which water is taken in, rather than through the mouth. These have a greater number of gills than the true fishes and an elaborated system for forcing the water over them and out through the external openings which may consist of a number of small slits laterally placed. Differing greatly in the several species of fishes, entirely wanting in some, are *gill-rakers,* pointing inward and forward, attached to the gill-supporting bones. These "rakes" are used in the dual role of assisting in food collection and in protecting the tender gills from possible injury through passage of harmful bodies over them. Such plankton feeding fishes as menhaden have gill-rakers well developed, while the weak fish, which feeds upon larger forms, has them but poorly developed.

An *air-bladder*, internally placed, regulates the weight displacement (specific gravity) factor permitting the fish to remain stationary at varying depths, without muscular activity. Also, it plays a part in sound production as in the case of the common croaker. This organ of equilibrium does not appear in elasmobranchs, cyclostomes and a few bottom inhabitating true fishes. When present in the last named forms, it is usually very small. Jordan, speaking of a juvenile fish, says "In the very little sunfish, when he is just hatched, the air-bladder has an air-duct, which, however, is soon lost, leaving only a closed sac. From all this we know that the air-bladder is the remains of what was once a lung, or addtional arrangement for breathing. As the gills furnish oxygen enough, the lung of the common fish has fallen into disuse and thrifty nature has used the parts and the space for another and a very different purpose. This will serve to help us to understand the swim-bladder and the way the fish came to acquire it as a substitute for a lung."

In a preceding paragraph it was pointed out that cyclostomes, elasmobranchs and true fishes differed markedly in skeletal features, both as to content and arrangement of parts. However, all are *vertebrates,* that is, animals with jointed backbones (vertebrae) in which the nerve cord lies dorsal to the axis of the column, to the ventral of which is the digestive tract. In most cyclostomes, as the lampreys of Maryland, the *notochord* skeleton persists as a well-developed structure throughout life. The sharks and other elasmobranchs possess a *cartilaginous* skeleton with remnants of notochord in the lenticular spaces between the vertebrae. The skull of the latter shows a decided advance in development over the former, having a well developed cranium, two large well formed nasal capsules and

two auditory capsules, as well as a prominent visceral skeleton. It is the third group, Pisces, sometimes classified as an *order* (Teleostei), which we have referred to as true fishes because they all possess *bony skeletons* either in part—ganoid-types, as the commercial sturgeon caught at Ocean City, and to a lesser extent in the lower Chesapeake and famed for its roe, which is used as caviar—or throughout the sustentative structure.

The exoskeleton of the yellow perch consists of fin-rays and scales, ctenoid rather than placoid † as in the shark group, while certain rays may be hard and spiny, thus offering a strongly protective surface. The endoskeleton, almost entirely bone, consists of distinct parts, the skull, vertebral column, pectoral girdle, ribs and inter-spinal bones.

The skull of perch, cranium, contains some cartilaginous parts, though mostly bone, and houses the brain, the auditory, olfactory and ocular organs. Parts of the skull, the viceral skeleton, are modified into jaws (mandibular arch) which bear teeth, into supports for opercula (hyoid) and into supports for the gills and rakers. The spinal column consists of nearly uniform vertebrae, each of which, typically, is cylindrical and with a neural cavity in it. A spine from each vertebra projects dorsally for muscular attachment and the ribs are strongly bound to the lower extreme of the lateral surfaces by strong ligaments. The posterior end of the column terminates in supports for the caudal fin. The ribs are free at the ventral end and form an arched cavity for the coelom in which the digestive and most of the other systems are housed. While the axial skeleton is well advanced in structure, the appendicular skeleton is only poorly developed. There is no pelvic girdle. The ventral fins are attached to a ridged though rather flattened bone which extends forward to the base of the pectoral girdle, the only representative of an appendicular structure. The pectoral fin-rays and the radials which connect them to the girdle articulate with the girdle, to which the pelvic muscles are attached.

What has been said here of the skeleton of the yellow perch holds, in a great measure, for all true fishes though many modifications of parts and decidedly different arrangements may be witnessed. The skeleton, even to the absence of certain appendicular parts, shows a development toward adaptation not excelled in the animal kingdom and, no doubt, accounts in a large measure for the efficient life in a medium many times heavier than air.

Of the well developed contractile system little need be said. The muscle cells are greatly elongated, especially in the trunk, and are

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† Other distinctive types of scales are the *ganoid*, as found on sturgeon and bowfin, and the *cycloid* found on herring and shad.

arranged in zigzag myotomes of varying lengths. By far the strongest muscles are those tapering toward the caudal fin and used in locomotion. Complex muscular arrangements actuate the organs of the head, while apart from those mentioned special muscles move the fins. It is this tissue which is valuable as food.

The *brain* of true fishes represents a distinct advancement over the other classes, especially the cyclostomes, having as it does the cerebrum, cerebellum, optic lobes and the medulla oblongota well formed and distinctly marked. The sense organs are connected to the brain by cranial nerves and the spinal cord, encased in the vertebral column, gives off spinal nerves. Thus highly sensitive throughout and through an interlocking of sense organs and a sharing of functions the active, responsive and alert animal is produced. The senses recognized in fishes are those of *taste,* in the mouth; *sight,* through paired eyes; *olfactory,* located in two pits anterior to the eyes and without mouth connections; *hearing,* but slightly developed in the ears, or membranous labyrinths, and most probably shared in by the sensitive lateral line, which is usually present. Response to *touch* is common over the entire body though the lateral line seems to play special part in gauging pressure. The ears, with their otoliths, seem to play a big part in the equilibrium of fishes. Indeed, if there be the added sense of balance in animals, as claimed by some, it could well be located, in this group, in the ear as a study will reveal.

The *digestive tract* of fishes varies according to habits. The canal may be short, as in most carnivorous species, or long, as in herbivorous forms. It passes through the body cavity from the mouth to the exterior opening, the anus, located just before the anal fin. Food, in reaching the stomach, passes over a rather ineffective tongue, through the pharynx and a short oesophagus. The stomach, in general, is a rather simple sack-like organ in which food is partially digested before passing on through the pyloric valve into the intestine, which leads to the anal opening. Caeca, or secretive bodies, attached to the digestive apparatus at the lower end of the stomach supply, in part, the juices needed for digestion. A well formed liver, dorsal to and nearly surrounding the stomach proper, empties bile into the forward end of the intestine through a duct leading from the gall-bladder. Other organs of secretion present in fishes are the spleen and the pancreas. Digested foods are taken up largely through the intestinal wall, while waste matter is voided through the vent.

Distribution of the diffused food takes place through a well defined *circulatory system* which is most closely associated with the respiratory system. While not conspicuous, a two chambered heart, lying in the pericardial division of the body cavity, pumps aërated and food

laden blood to all parts of the body. Returning, the blood bears off the excreted waste, which is gotten rid of through kidney removal of urea and through the gas-exchange already referred to. The blood plasma contains both red and white corpuscles and in reaching the most remote and the smallest parts of the body, it travels through a well defined closed system of arteries and veins. Circulation is comparatively slow. Osmotic phenomena play, no doubt, the greatest part in the many exchanges of liquids and gases to and from the blood; osmosis being made possible by the complex and variable nature of protoplasm. The circulatory system of true fishes shows a marked advance over that of cyclostomes and, in most cases, that of elasmobranchs as well.

It has been set forth that amino-acid wastes, urea, are voided in the course of circulation through the agency of *kidneys*. There are two of these organs, greatly elongated bodies, attached to the dorsal wall of the abdominal cavity. From each kidney there runs a small tube, the *ureter,* which conveys the liquid waste posteriorly to a *bladder* where it is stored until expelled from the body through a second opening just in front of the anal fin. Connected to this same opening is the genital or *reproductive system,* consisting of two *testes* in the male and two *ovaries* in the female, the sexes being separate. The reproductive bodies are prominent, extending practically the entire length of the body cavity. In the yellow perch a short oviduct leads from each of the ovaries to the urinogenital sinus, while a short sperm duct connects each of the testes to the sinus. These ducts may be entirely absent in some female fishes, in which case the germ cells are passed to the exterior through small genital pores between the reproductive bodies and the sinuses. Still other forms pass the eggs into the coelom, or body cavity, where they may be retained for a period before being deposited. When the period for spawning approaches the ovaries become greatly distended and fill the greater part of the body cavity giving the fish a swollen appearance. The reproductive system of lampreys and related members is of a comparatively low order, while the account here given may, in a general way, be taken as applying to all true fishes.

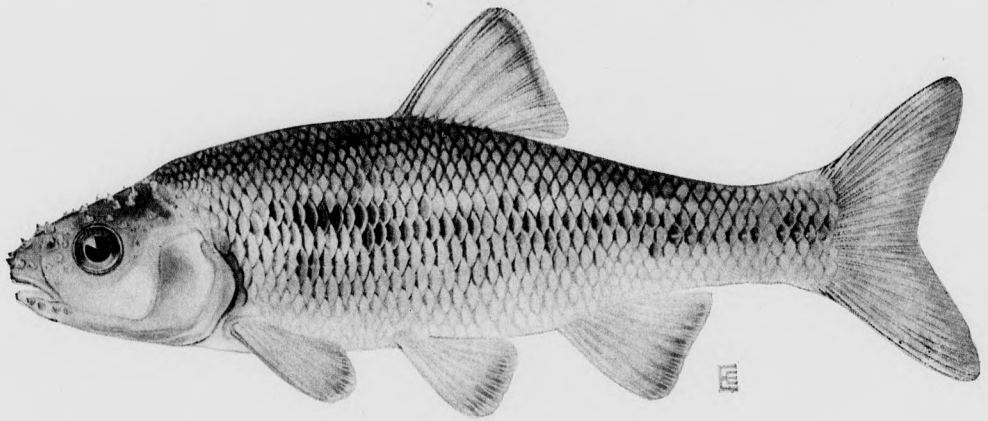
Reproduction and Breeding Habits of Fishes

Development of eggs of fishes varies according to environmental conditions. As would be suspected those found near the surface and those in warmer waters hatch in shorter periods than others. About three weeks time is required for the development of yellow perch eggs, varying with the temperature. While the stages of embryological development are well known it is not a part of this work to give the

details of same. Suffice it to say that the egg yolk, food sac, is conspicuous due to its size. A germinal disc is present and after fertilization cleavage takes place through an orderly course of segmentation until the blastoderm encases the yolk, after which stage the embryo begins to take fish form developing a head and tail soon to be freed from the yolk. After breaking out of the egg membrane the young fish is sustained by the yolk content until it is able to gather its own food, the diet being largely protozoa and small crustacea at first but changing as growth ensue to larger forms. It should be noted, however, that there are those fishes, like the alewife, which feed upon entomostraca throughout life and still others, gold fish for instance, which consume only vegetable matter.

By far the greater number of fishes produce unfertilized eggs, thereby necessitating external fertilization. There are those, however, in which conjugation of germ cells is internal, the ovoviparous and viviparous forms. In the first named the eggs are held within the body until hatched, the juveniles being liberated from the body at that time. The viviparous fishes, as in the common shark, *Mustelus canis,* develop their young, after internal fertilization, through a crude placental connection and upon birth the young are comparatively large and active. When unfertilized eggs are produced the female is usually accompanied to the "spawning grounds" by the male and while she is depositing the eggs the male splashes around her ejecting sperms into the water. The male cells are motile and upon coming in contact with the ova they penetrate the latter and development is initiated. The numbers of eggs and sperms produced are prodigious. We have estimated from a single herring over 18,000, while sturgeon have been known to produce upward of half a million eggs in the roe of a single individual. Many more sperms, the motile germ cells, are produced than eggs since chances for fertilization in the open waters are poor. Their number could barely be estimated in the millions.

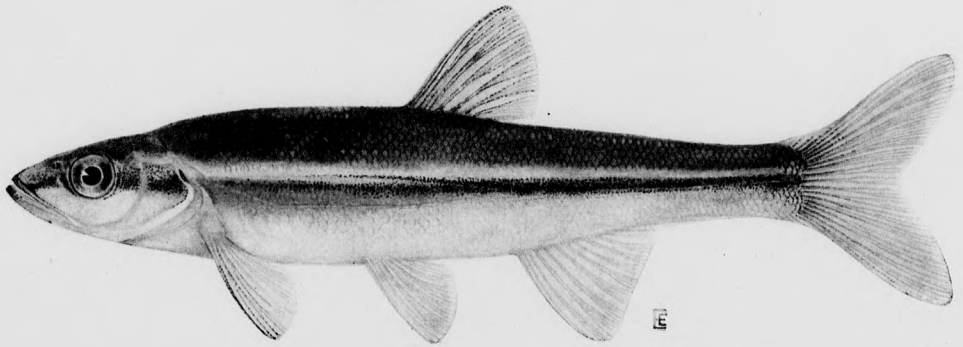
Only a few fishes care for their eggs and young. In most cases favorable breeding areas are chosen thereby reducing the number of enemies at this vulnerable period. Protective coloring and instinctive habits in the young contribute largely to their survival. Considering the method of fertilization and the absence of parental protection, it is easier to understand the vast production of germ cells. Incidentally, the ovoviparous and viviparous species produce comparatively few eggs. The common shark produces from three to eight young during a single period of gestation. Of those fishes which do offer means of protection for the eggs or young, the sea-horses, sun-fishes and sticklebacks are most interesting. The first named store their eggs in a pouch on the ventral surface of the males where they are



RED-FIN SHINER, *Notropis cornutus* (Mitchill)
Breeding colors from male 4⅜ inches long.

FIGURE No. 2

COURTESY OF NEW YORK STATE CONSERVATION DEPARTMENT



RED-SIDED DACE, *Clinostomus elongatus* (Kirtland)
Breeding colors from male about 3 inches long.

FIGURE No. 3

COURTESY OF NEW YORK STATE CONSERVATION DEPARTMENT

protected until hatched and the young are able to care for themselves. Some sun-fishes and most sticklebacks, by use of their fins, wallow out nests in which the eggs are deposited, after which the male stands guard, fiercely attacking all comers, even to the point of resenting and attacking the human hand.

Color of Fishes and Electric Phenomena

Great variations are noted in the coloring of Maryland's fishes, though the extremes found in the tropical forms are not witnessed. Most of our forms are modestly colored, usually with a drab or dark upper surface and a silvery or pale-white ventral surface. A few species have marked differences in coloration of the sexes and especially in certain fresh-water fishes do we find mating or breeding colors, as in the case of the common minnows of the Notropis group. The brilliant shiner or dace—see figures 2 and 3—of mid-spring is typical. Maryland's marine fauna takes on little nuptial coloration.

Coloring in fishes is due to deflection of light on the one hand or pigmentation on the other. A combination of the two is common; most metallic and iridescent shades are produced by refraction and reflection of light incident upon type scales or polished skin. Pigment cells, varying in shape and size are found in the skin, while oil droplets near the base of scales produce various shades. It is because of the pigmentation and oil content that fish colors are so difficult to retain when being preserved. The arrangement of colors into patterns and designs is so varied as to arouse the imagination. Such characters may serve the purpose of recognition among individuals of a species, while they are almost the sole means of the fisherman in making his determinations. Scientists use them to advantage in taxonomic work though they are not altogether reliable. In addition to sexual, nuptial and recognition coloration, undoubted protection is afforded; many examples of which are to be found in the State, as in the case of the flounder which lies on a sand bottom unnoticed, except by the most expert eye. Remora, the "pilot-fish" or "sucking-fish" found in the Chesapeake, cling by cephalic disks to the ventral surface of sharks and others and are towed about in the open waters from one feeding area to another. The "pilot" does no harm to the host except possibly to slow it up. But in the exposed position it is subject to the attacks of enemies on all sides, to offset which its belly has developed, apparently, a coloring which harmonizes perfectly with that of the shark. It is believed that protective coloration in our fishes is more marked than in any like division of the animal kingdom. Its success is unchallengeable.

Electric and luminous organs are not uncommon in Elasmobranchs. In the former electricity is formed and stored to be discharged

upon demand. In the latter luminosity seems to be produced by phosphorescent integuments located on or near the surface. The processes involved in actual generation of electricity are not clearly understood. Numerous nerve fibers pass to the various parts of the electric organs which are formed from metamorphosed muscle tissue. The nerve fibers are derived from direct connections with what is termed an electric lobe of the medulla and are subject to voluntary action, though of short duration. Very strong discharges are to be found in Torpedo-Rays, not uncommon along Maryland's coast, which are able to stun their prey and to successfully combat their enemies. The "electric eel," *Electrophorus electricus,* a true fish of South America, has developed this characteristic to the extent of being feared by man.

Fish Migrations

Migrations of fishes are not at all satisfactorily known. Ichthyologists and ecologists are giving liberally of time and thought to this question and with the now extensive tagging operations of the United States Bureau of Fisheries, foreign agencies and private interests, much promises to be contributed to the subject. Tardily, as it is, it is now recognized, because of inadequate knowledge on the subject of migrations, measures have not been taken and proper regulations have not been framed for the conservation and restoration of our fishes and fish industries.

Few are the fishes which do not migrate even though the distance be short. Driven by some strong force of nature, probably temperature and food, which obviously are associated, or by the breeding instinct and consequent maturity of reproductive organs, movements are started which may lead for thousands of miles on the one hand, or for a matter of yards on the other, to a particular type of surrounding. Certain eels, apparently, cross the Atlantic Ocean, while sunfishes for the most part move only a few yards to deposit their eggs. Temperature and food combine largely to form the impelling force in many fishes and the distances travelled, likewise, is embraced in wide limits. Migrations are closely associated with distribution, under which topic the habits of anadromous and catadromous types were discussed at greater length.

Before launching a discussion on the foods and the economic importance of fishes, it should be pointed out that the ecology, dispersal, adaptations, instincts and the mythology of fishes, each and all, hold interests barely if at all surpassed by other classes of animals. Undoubtedly no similar group of vertebrates shows so great a variation in form and function of parts as do fishes. Found practically everywhere, in frigid water, in hot springs, at the depths, near the surface,

in shallow waters, in subterranean channels and to a limited extent even on land, their dispersal is complete. Their persistence through vast ranges and their great number of species testify for their instincts and adjustments to environmental conditions. That the sirens of old, though associated with water, were fishes has not been established, however, few myths are more fascinating and vivid than those involving mermaids, sea serpents and others supposed to be of the finny tribes.

Foods of Fishes

Directly or indirectly all animals feed upon vegetable matter. In our laboratory we found in the stomach of a black bass two daces which, upon dissection, gave up small insects and microscopic crustacea, direct plant feeders. Thus we have a chain of three links anchored to vegetation. Some forms feed upon plants directly. It is the relation between fishes and aquatic vegetation that makes Maryland's fisheries so valuable and her Chesapeake so highly prized. This body of water drains a vast area of fertile soil, a fourth of New York and nearly all of Pennsylvania and Maryland, approximately fifty millions of acres. From this great tract organic and inorganic materials of unthinkable proportions find their way to the Bay through the creeks and rivers. Here they are converted into plants, probably more effectively than if they had remained in the soil, for much of them is in solution and diffused throughout the water, thus offering many strata rather than one surface for plant production.

The luxuriant vegetation produced in the sediment and throughout the water is, for the most part, microscopic. Growth and reproduction in this flora is phenomenal, and, indeed, were it not for the myriads of minute animals and other enemies feeding upon it, but a few days would be required for it to fill the navigable waters solidly. It is right here that our first links of the chains referred to are welded. It is believed that over eighty per cent of the available food organisms in the State are not being converted in commercial fishes because of depletion of the native species.

Because of the nature of the valuable sediment and diffused materials, the tiny size of the unicellular plants, and the barely noticeable animals which thrive under such conditions, the practical man and even the naturalist is prone to overlook the great importance of these factors. Their presence accounts in a large measure for the many areas chosen in Maryland by anadromous fishes for the deposition of their eggs. They are the *sine qua non* of the fish families. It is upon these that pollution and other deleterious matter acts with such telling force, removing the source of food for the developing young or, as in the case of shad and alewives, destroying the food directly.

Terrestial vegetation plays a big part, largely indirectly, in fish economy. Many fresh water fishes depend in a great measure upon insects which fall in the water. Quantities of grass and even leaves are consumed by others. Frogs, snails, crustacea and other plant dependent animals are consumed in quantities by many species, both marine and fresh-water inhabitants. Some forms are strictly carnivorous, pike for instance, others strictly herbivorous, as the gold fish, while still others are omnivorous, as the carp. Cannibalism is a rather common practice among fishes and a menace in many forms of cultural work. The young of practically all fishes are plankton feeders. The worst aquatic enemies of fish are other fishes, for the carnivorous members predominate numerically and in size.

Economic Importance of Fishes

The economic importance of Maryland's fisheries is difficult of estimation. In the State's waters there is a vast array of edible and, for the most part, choice fishes which not only supply a big local demand but great shipments are made afar. Some of these fishes are salted for preservation, others are ice packed and still others, though not a general practice, are refrigerated for storage and transportation. Smoking is practiced on a small scale. Roe of herring, shad and, especially, sturgeon is sold on the caviar market. Fish, for the most part small alewives, are converted directly into fertilizer for agricultural purposes in certain sections, while directly and indirectly millions of pounds of these and other forms are contributed to the fish factories, the end products of which are oils and fertilizer ingredients. In relation to health, due to destructions of mosquito larvae and other pestiverous forms, a great unappreciated asset exists in our fisheries, while the pleasure offered to that nowise small number of citizens who, with hook, line and bait, seek recreation out of doors, is not calculable in dollars and cents.

Commercially, fishes are put to uses other than that of direct food or of fertilizer production, though Maryland's supply is nearly entirely given over to the first named purpose. Fish meal is a valuable commercial realization and is growing in importance, while the medicinal qualities of certain fish parts are fully appreciated. Skins of several species are promising substitutes for leather, while oil and glue by-products of the fish-factories are about indispensable. Even the scales are being reclaimed from several species and converted into pearl essence to manufacture materials barely distinguishable from the genuine pearl. However, it is the food fish that is of such vital concern at present, due to the vast quantities consumed annually by man and the constructive part they play in his diet as iodine conveyers.

By weight, upward of 15,000,000,000 pounds, probably conservatively estimated, of fishes are taken yearly world wide, not including

oysters and other shell fishes, crabs and like edible sea forms sometimes called "fishes" or, more aptly, "shell fishes." Seven and one-half millions tons of fish, a gift of Nature available without effort on the part of man, except for the gathering, form the basis of unique industries to which the United States contribute over two and a quarter billions of pounds annually. The food produced by the various branches of fishery industries undoubtedly ranks second, in quantity as well as in value, to agriculture.

It is difficult to estimate the comparative values of the fisheries of America, and especially to obtain accurate data on the catches in Maryland, since an investigation reaches only those men who are in the business on a rather large scale, the pound-fishermen and those similarily interested. Nearly every individual living along the tide-water section and near inland streams is a fisherman, at least during leisure hours, and these thousands catch an enormous supply. Added to these catches are those taken by the sportsmen, who, individually, profit more by the experience than by the value of the catch, though the latter in monetary terms would mount to figures almost startling. It probably would not be unfair to say that over one-fifth of the fishes taken from Maryland's waters are taken by the non-commercial fishermen.

The most important American fisheries are salmon, herring, cod, haddock, halibut, sea-trout (weak-fish), shad, croakers and rock or striped bass. The following figures show the enormous annual output of some of the more common fisheries: herring, 950,000,000 pounds; salmon, 475,000,000 pounds; cod, 100,000,000 pounds and sea-trout, 40,000,000 pounds.

In order of importance, and with approximate values, Maryland's leading fisheries rank as follows: shad, $258,888; rock or striped bass, $223,838; butter-fish, $132,000; sea-trout or squeteague, $103,871; herring, $84,408; croaker (hard head), $68,623; white perch, $53,872; eels, $39,787; yellow perch, $27,997; catfish, $19,505, and carp, $17,771. About forty other species of fishes are of commercial importance to the fishermen of the state with values ranging from the minimum given down to a few dollars. The most important of these minor fisheries are spot, flounder, sea-bass, sturgeon, blue-fish, and black bass. Economically, the fishes of Maryland contribute approximately two million of dollars yearly to the State's wealth.

Conservation of Maryland's Fish Resources

Marylanders, in common with most Americans, have exploited in a great degree their fish resources with little regard for the consequences. Over fishing, operating out of season, refusal to accept size regulations, destructive nets and devices, and, especially, operating on and

near the spawning grounds throughout the breeding season have proved disastrous to nearly every branch of the State's fisheries and threaten to destroy some of the one-time most productive forms. Shad, for instance, quoting from the Statistical Bulletin, ‡ have been depleted from the 1890 peak of production, 7,127,486 pounds, to the present low level of approximately 1,333,333 pounds, while the total supply of fishes from all branches has been reduced in the same period from one hundred per cent to forty per cent. The fact that prices have advanced from two to ten fold as the downward trend of production has taken place has blinded, in a measure, those who operate the industries and has been largely responsible for the general apathy toward methods of conservation.

The science of aquicultural conservation—using the word here to mean production and wise use—has not progressed in a marked degree in America, and has, until recently, been very backward in Maryland. Land areas have been subjected to investigation since the early development of civilization and during the past century most thorough study has been promoted, with the result that, through intensive cultivation and improved strains, we can safely prophesy great increases for the future. No similarly intensive study of water areas has taken place and, at present, the aquicultural outlook is otherwise than promising. Indeed, if the scientific world, in general, and the conservationists backed by state authority, in particular, are not encouraged to a greater extent, total destruction of many of the commercial forms of the sea is highly probable. It seems safe to speculate that, should the present rate and methods of depletion continue, fifty years hence Maryland will not have a single fish industry left, and several of the choicest species will have become extinct.

It is not intended to convey the idea that the resources of the sea are unlimited as enthusiasts often proclaim. Seas have their deserts, as much so as do continents, and for reasons somewhat similar. The cooler waters away from the tropics and near the coast line, due to the physical nature of water, are richer in the essentials for plant life, the *sine qua non* of fish or other animals, and it is here that the greatest industries have been made possible. The essentials referred to are not inherent with the sea, however, for they are gasses and minerals brought to it by water which, as rain, leached through the soil and took them into solution. Water is the greatest of all solvents and cold water will hold relatively greater quantities of foreign matter. The fact that the Chesapeake Bay drains one-fourth of New York, practically all of Pennsylvania and Maryland and a great part of Virginia and Delaware, much of the richest land area of America and a region with an

‡ Data taken from Statistical Bulletin No. 745, Bureau of Fisheries, United States Department of Commerce, Fisheries of Maryland and Virginia, 1925.

abundant rain fall, combined with the fact that its water temperatures rarely reach eighty degrees even in the most protracted warm weather and are comparatively cold throughout the year, makes its fish potentialities second to only one or two like water areas in the world.

With the physical and chemical conditions of the water excellent it is apparent that sane conservation should maintain at least a constant supply of Chesapeake and coastal products yet, in spite of improved methods of catching as the power boat and modern apparatus and better facilities for handling through freezing and shipping, there has been a constant diminution in output. The outstanding reason for this continued depletion is found in the failure to promulgate adequate protection not alone for the assuring of spawning grounds and open channels to the fishes, but against the wasteful methods of capturing, including the vast destruction of young and unmerchantable fishes. Unfortunately, the need of a more thorough-going policy for aggressive conservation is not appreciated by the fishermen of Maryland at this time, and their resentment of non-tidewater interest, progressive as it may be, militantly reflected biennially is responsible for the chaotic consideration given by legislative bodies. It is true, then, that the salvation of Maryland's fisheries rests upon the efforts made to better acquaint the fishermen themselves with the conditions that exist, and this without loss of interest or the leadership of those, the decided majority, who take pride in the aquicultural resources because they are a distinct State asset belonging as much to those who come after us as to us.

ACKNOWLEDGMENTS

For our limited treatise on Maryland Fishes acknowledgments are due to the many with whom we have fished, among whom are the sons of B. A. Bean, Ernest B. Marshall of Laurel, Alfred C. Weed, "Bill" Wallis, "Jack" Peyton, "Audie" Ridgway, Dr. R. W. Shufeldt and his sons, E. D. Reid, James E. Benedict, Jr., Watson Perrygo, the late Wm. Palmer, Jesse Reisler of Carroll county, Captains Nat Dare, Harvey Mister, Andrew Johnson, and many commercial fishermen as well as sportsmen.

To the U. S. National Museum we are indebted for the free use of the collections and copies of figures used in its various publications. Liberal use has been made of Bulletin Number 47.

To Swepson Earle, Commissioner, and the Maryland Conservation Department, and the Department of Zoology of the University of Maryland, we acknowledge many courtesies.

For the short comings in the work as a whole we can offer only the excuse of being very busy men.

CLASSIFICATION *

The taxonomic arrangement of the families on the following pages is not intended to reveal an evolutionary sequence, while a key to the orders, families, etc., has been omitted. With a complete index, carrying both the common and the scientific names, and a description of every species known by us to have been collected in Maryland, it is hoped that by using the cuts and by the process of elimination, those not trained in ichthyology may be able to determine forms in which they are interested. In case of doubt, specimens should be sent to a local authority. The Bureau of Fisheries and the National Museum, both at Washington, D. C., promptly render the service of classification of fishes.

* For abbreviation in printing, the usual form of technical works has been adopted, *i. e.*: Head 3, means its length in total length without caudal (tail) fin; depth 4, ditto; D. X. 10, is dorsal ten spines (X) and ten rays (10); A. for anal; V. for ventral; P. for pectoral; C. for caudal; sc. for scales.—May 12, 1928.

THE FISHES

Family **Petromyzonidæ**

GREAT SEA LAMPREY; LAMPREY EEL

Petromyzon marinus, (Linnæus)

Petromyzon marinus, Linn., Syst. Nat. ed. X, 230, 1758, European seas; after Artedi.

Body cylindric, eel-like, stout, somewhat compressed behind. The mouth is terminal, subcircular in shape and suctorial. It is strongly armed with large conical teeth or cusps, those of the inner series being bicuspid. There are seven branchial apertures on each side of the head, the first not far behind the eye; the distance of the last opening from the tip of the snout is contained about five times in the total length. Eye rather small. The Sea Lamprey grows to a length of three feet. It is dark brown in color, mottled with black and white. In the breeding season in spring the males have a high fleshy ridge in front of the dorsal. The spawning is believed to take place in May or June. The eels cling to the rocks by means of their suctorial mouths and the eggs are deposited in shallow water on a rough bottom where the current is swift. Some observers state that they make nests by heaping up stones in a circle, and deposit the eggs under the stones. The ovaries are large, but the eggs are very small. The food of the lamprey is chiefly animal matter, and the fish is somewhat of a parasite, burrowing into the side of the shad, sturgeon and some other species.

The lamprey is considered a good food fish in some localities, but in other places it is rarely eaten. It is preserved by salting for several weeks before using. The fish is sometimes caught with the hands or by means of a pole armed with a hook in the end.

It is found along the Atlantic Coast of Europe and North America, southward to Chesapeake Bay.

Maryland localities: Anne Arundel, Baltimore, Cecil, Harford, Kent, Prince Georges and Montgomery counties.

BROOK LAMPREY

Lampetra lamottenii, (Le Sueur)

Cusps of supraoral usually bitubercular, always weak and rounded, separated by a short, narrow isthmus, the base of the cusps poorly developed; infraoral lamina without distinct denticles, the crest crenulated or even nearly entire; all teeth greatly reduced; the anerior field of the disc with but few (about four) denticles, placed laterally and separated by a broad toothless median area; the three laterals of each side obsolescent, with scarcely developed bases, sometimes unicuspid or with the two or three cusps isolated as more or less widely separated denticles; myotomes fewer, 54 to 60 between the last gill opening and vent. Ohio and Potomac River basins.

This interesting little Lamprey occurs in considerable numbers in brooks and streams of the Potomac and Susquehanna drainage. It clears out a small saucer-like depression in the sandy bottoms of the streams, where it reproduces. The males are usually of a light slate color, while the females are darker and often more or less mottled.

Family **Pristidæ**

COMMON SAWFISH; Pez Sierra; Pez de Espada.

Pristis pectinatus (Latham)

Pristis pectinatus, Latham, Trans. Linn. Soc., II, 1794, 278, "In the Ocean."

First dorsal over ventrals, second dorsal scarcely smaller than first; no lower caudal lobe. Saw with 24 to 32 pairs of teeth, the posterior farther apart than the anterior. L. 10 to 20 feet. Tropical seas, north to West Indies and Florida; abundant in the Gulf of Mexico; ascending the lower Mississippi.

Maryland localities: Worcester County, Chesapeake Bay.

Family **Squatinidæ**

ANGEL SHARK; "Viper of the Sea"

Squatina dumeril, (Le Sueur)

Squatina dumeril, Le Sueur, Journ. Acad. Nat. Sci. Phila., I, 1818, 225, Florida.

Ray-like sharks. Body depressed and flat, the snout obtuse, the mouth anterior, teeth conical, pointed, distant, pectoral fins very large, expanded in the plane of the body, but not adherent to the side of the head, being deeply notched at the base; ventral fins very large, dorsal fins 2, small, subequal on the tail behind the ventrals; no anal fin; caudal small, gill openings wide, partly inferior, partly hidden by the base of the pectoral; spiracles wide, crescent shaped behind the eyes, nostrils on the front margin of the snout, with skinny flaps, males with small prehensile appendages; vertebræ tectospondylous. A single genus among living forms, with but one species so far as known; a small shark of singular appearance, found in most warm seas. In appearance as in structure, this family is strictly intermediate between the sharks and the rays. Its nearest living allies are probably the Dalatiidæ. Two or more related genera are found as fossils.

Maryland localities: Worcester county.

Family **Squalidæ**

DOGFISH; PICKED DOGFISH; BONEDOG; SKITTLE-DOG

Squalus acanthias, (Linn.)

Squalus acanthias, Linn., Syst. Nat., ed. X, 1758, 233, coast of Europe.

Body slender, snout pointed; head 6½ in length; depth about 8. Dorsal spines rather high, that of the first dorsal about 2/5 height of fin, the second dorsal spine about 3/5 height of fin. Slate color above, pale below, back with oblong whitish spots, especially in the young, these rarely all obsolete in the adult. Length 2 to 3 feet; weight 5 to 15 pounds. A small sharp toothed shark, ranging widely in the Atlantic, very abundant along the shores of the Northern and Middle states, and taken as far south as Cuba. From its livers "Dogfish" oil is extracted. It feeds largely on herrings.

Maryland localities: Worcester, Somerset and St. Mary's counties.

1. As *Carcharhinus obscurus* (nom Le Sueur) Smith & Bean, Bull. U. S. Fish Comm., 18, 1898 (1899) p. 180.
2. Forest and Stream, 18, March 30, 1882, p. 172.

Family **Sphyrnidæ**

HAMMER-HEADED SHARK

Sphyrna zygæna, (Linn.)

Squalis zygæna, Linn., Syst. Nat., ed. X, 1758, 234, Europe, America.

Head hammer-shaped, its width about twice its length; length of hinder margin of hammer nearly equal to its width near the eye; nostril close to eye, prolonged into a groove which runs along nearly the whole front margin of head; first dorsal large, second quite small, smaller than anal; pectoral rather large. Color gray. A large voracious shark, reaching a length of 15 feet or more, found in all warm seas; occasionally on our coasts from Cape Cod and Point Conception southward.

Maryland localities: Worcester county and Tangier Sound. Uhler and Lugger report it from the mouth of Miles River.

Numerous young and occasional large specimens are taken in the pound nets at Ocean City, Md.

Family **Eulamiidæ**

TIGER SHARK

Galeocerdo tigrinus, (Müller and Henle)

Galeocerdo tigrinus, Müller and Henle, Plagiostomen, 59, pl. 23, 1838.

The caudal fin forms about one third of the total length and exceeds the space between the dorsals; the second dorsal is in advance of the anal; upper jaw with a long labial fold; teeth 25/25. Color yellowish gray, whitish beneath, brown on the middle of the back and with numerous brown cross bands and spots on the sides; adults nearly uniform brown. Said to reach a length of 30 feet. Tropical seas, occasionally found in summer northward to Cape Cod and to San Diego.

Maryland localities: Worcester County, and Chesapeake Bay.

MILBERT'S SHARK

Carcharinus milberti, (Müller and Henle)

Carcharias (Prionodon) milberti, Müller & Henle, Plagiostomen, 38, 1838, New York.

This species differs from *C. platyodon* chiefly in the following respects: Head longer, snout much less obtuse, its length from mouth equal to breadth of mouth; distance between nostrils ⅛ less than length of snout. Teeth and fins as in *C. platyodon*. Pectorals rather small, not falcate, 6½ in body; caudal four in body, rather narrow. Cape Cod to Florida; not rare, but very imperfectly described.

Maryland localities: Cecil, Charles, Prince Georges and Worcester Counties.

Family **Galeorhinidæ**

SMOOTH HOUND; DOG SHARK

Mustelus canis, (Mitchill)

Squalus canis, Mitchill, Trans. Lit. Phil. Soc., N. Y., I, 1815, 486, New York.

This is one of the commoner species of our coast, of small size, known as Dog-fish, ranging from Cape Cod to Cuba, across the Atlantic to the Mediterranean. Small slender body, tapers backward from the dorsal fin to the long slender tail. Small mouth, blunt teeth. Coloration light grey, nearly uniform, or with pale spots. The young, seven in number, are developed within the body.

Maryland localities: Worcester County, Chesapeake Bay.

Family **Orectolobidæ**

NURSE SHARK

Ginglymostoma cirratum, (Gmelin)

Squalus cirratus, Gmelin, Syst. Nat., I, 1492, 1788.

This harmless shark has an obtuse depressed head. The nasal cirrus reaching the lower lip; angles of the fins obtusely rounded, the long tail forming nearly one-third of the total length; skin very thick. Color of adult uniform brownish; this color in young specimens is relieved by numerous small round black spots. The teeth in both jaws in many series, each with a strong median cusp and one or two smaller cusps; second dorsal nearly opposite anal.

The Nurse-shark grows to length of ten feet or more, inhabits the warmer seas of the Western hemisphere, being abundant about coral reefs and sandy shores of the West Indies. It is rare on our south Atlantic coast, and Uhler and Lugger report the capture of one in the Chesapeake Bay.

Family **Isuridæ**

GREAT WHITE SHARK

Carcharodon carcharias, (Linn.)

Squalus caracharias, Linnæus, Syst. Nat., ed. X, 235, 1758.

This shark, also known as Man-eater, has a very stout body, large mouth, jaws with five rows of very large triangular-shaped serrated teeth, about 24/22 in each row. The first dorsal behind pectorals, caudal fin large, color leaden-grey, tips of pectorals black. This is one of the largest of the sharks, reaching a length of 30 feet or more, and ranges in all temperate and tropical seas. In Maryland, along the ocean beach of Worcester county and smaller specimens are said to occur in Chesapeake Bay.

Family **Alopiidæ**

THRESHER SHARK

Alopias vulpes, (Gmelin)

Squalus vulpes, Gmelin, Syst. Nat., I, 1496, 1788, Mediterranean; after Pennant.

Body moderately elongate, the snout rather short; mouth crescent shaped, teeth equal in both jaws, moderate sized, flat, triangular, not serrated; the third tooth of the upper jaw on each side much smaller than the others; gill openings moderate, the last one above the root of the pectorals; no nictitating membrane; spiracles just behind eye, minute or absent; first dorsal large, midway between pectorals and ventrals; second dorsal and anal very small; caudal fin exceedingly long, about as long as the rest of the body, a pit at its

root, a notch on the upper lobe near its tip, lower lobe moderately developed; no caudal keel, ventrals rather large, pectorals very large, falcate. A single species, reaching a large size, inhabiting most seas, known at once by the great length of the tail. It abounds in the Mediterranean and Atlantic. It is also frequently taken on our Pacific coast.

Maryland localities: Worcester county.

Family **Carchariidæ**

SAND SHARK

Carcharias taurus, (Rafinesque)

Caratteri di Alcuni Nuovi Generi, 10, 1810 *(Sicily)*.

This small but voracious shark is common on our Atlantic coast, especially from Cape Cod to Cape Hatteras. Its maximum length is 12 feet.

Maryland localities: Worcester county and Chesapeake Bay.

Family **Galeidæ**

DUSKY SHARK

Carcharhinus obscurus, (Le Sueur)

Squalus obscurus, Le Sueur, Jour. Ac. Nat. Sci., Phila., 1818, 1, 223, New York.

Head rather pointed, flattened above and below; first dorsal rather large; second dorsal smaller than the anal, and considerably produced behind; pectorals very large, falciform, extending beyond the end of the dorsal, their outer margin four times the inner. Dark clear blue above, white below. A large shark, reaching a length of nine or ten feet, inhabiting the Middle Atlantic and rarely taken on our coast.

Maryland localities: Worcester county and Chesapeake Bay.

Family **Rajidæ**

COMMON SKATE

Raja erinacea, (Mitchill)

Raia erinacea, Mitchill, Am. Jour. Sci. Arts, XI, 290, 1825, New York.

Form rhomboid, with all the angles rounded, spines largest on the anterior extensions of the pectorals, where they are close set, strong, laterally compressed and hooked backward; smaller ones are scattered over the head above the spiracles, above and in front of the eyes and on the back, the median line of which is comparatively smooth, without larger median series, except in the young; a triangular patch on the shoulder girdle; inner posterior angles of the pectorals nearly smooth; in the males near the exterior angles of the pectorals are two rows of large erectile hooks, pointing backward. Females with groups of small scales on each side of the vent; teeth small, the middle ones sharp in the males; all blunt in the females; jaws much curved; each side of tail with a dermal fold; caudal fins rough, not separate to the base. Color light brown, with small round spots of dark brown; no pectoral ocelli. Length one to two feet. The smallest and commonest of our skates; abundant on our coast from Virginia northward to Maine.

Maryland localities: Worcester county and Tangier Sound.

BRIAR SKATE

Raja eglanteria, (Bosc) Lacépède

Raia eglanteria, Lacépède, Hist. Nat. Poiss., II, 103, 1800. (Charleston, South Carolina.)

Prickles small and very sharp, most numerous on the anterior portion of the pectoral, over the head, snout, middle of the back and on the tail between the rows of larger ones; enlarged spines present around the eyes and spiracles on the middle of the snout, in a median row along the back and in two rows along each side of the tail. These spines are very sharp, larger and smaller ones alternating in the rows. A large spine in each shoulder, a spine between the caudal fins. Color brown with bands, bars, lines, blotches and spots of darker color in the middle of the pectoral; a translucent space on each side of snout. Length about two feet. Cape Cod southward to Florida. Common.

Maryland locality: Worcester county.

BARNDOOR SKATE

Raja lævis, (Mitchill)

Raja lævis, Mitchill, Amer. Monthly Mag., II, 327, 1817, N. Y.

Angles of the disk more acute than in any of the others; muzzle much produced, somewhat shovel-shaped at tip. Spines of the body very few and small; some present above the eyes and spiracles, on the snout, along the anterior border of the pectorals, and on the back; those on the back very small; a median dorsal row of larger hooked spines extending along the median line of the posterior portion of the back and the tail; usually two lateral rows

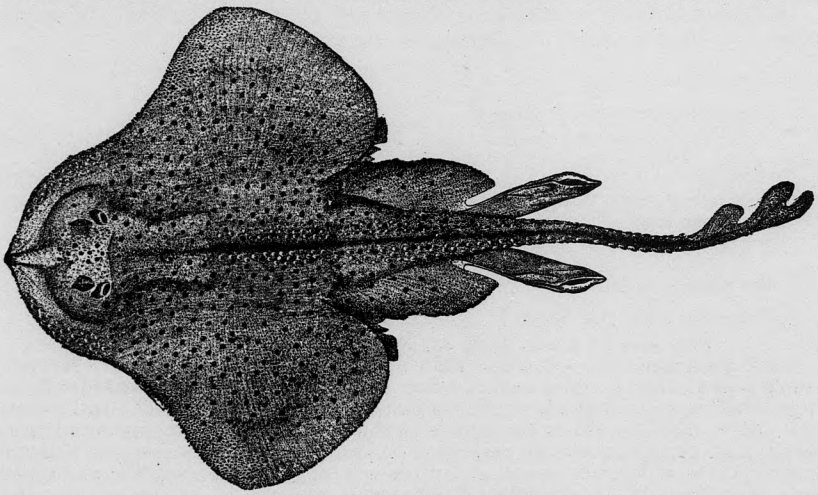


Fig. 4.—Raja erinacea

on the tail. Female rougher, as usual among rays. Color variable, brownish, with paler spots which are usually ringed with darker. The largest of our Atlantic species, reaching a length of four feet. New England to Florida; not uncommon northward.

Maryland localities: Worcester county and Chesapeake Bay.

Family **Torpedinidæ**

TORPEDO; CRAMP FISH

Torpedo nobiliana, (Bonaparte)

Torpedo nobiliana, Fauna Italica 3, 1832 to 1841.

First dorsal more than twice as large as second, its insertion over middle of the ventrals, spiracles not fringed, their edges smooth. Color almost uniform black, with obscure darker spots; beneath white. Length 2 to 5 feet, breath ¾ of length, the disk very blunt or almost emarginate in front. Atlantic coast of United States, Cape Cod to Cuba; not very common. A large species, allied to the European *T. nobiliana*, has the second dorsal smaller and inserted farther back.

Occasionally found at Ocean City.

Family **Dasyatidæ**

COMMON STING RAY; STINGAREE; CLAM CRACKER

Dasyatis centrura, (Mitchill)

Raja centrura, Mitchill, Trans. Lit. Phil. Soc., N. Y., I, 479, 1815, New York.

Disk quadrangular, about ¼ wider than long. Anterior margins sinuous, concave opposite the eyes, convex toward the slightly protuberant snout and rounded outer angles, posterior margin straighter, very little convex, inner convex, hinder angles blunt. Ventrals truncate with rounded angles. Tail more than twice as long as the disk, much compressed rounded above, with keel

or cutaneous expansion below, with one or more strong serrated spines at the termination of the anterior fifth of its length, rough on all sides with spines or tubercles. Till half grown the young are smooth; as they approach maturity broad stellate-based, conical-pointed, irregularly placed bucklers appear on the middle of the hinder part of the back and on top and sides of the tail. Very large examples have the central portion of the back closely mailed with small flattended tubercles. Mouth arched forward, with five papillæ, teeth in quincunx, blunt, smooth. Color on back and tail olive brown, nearly white below. Coast of Maine to Cape Hatteras abundant, reaching a length of 10 to 12 feet.

Maryland localities: Worcester county and occasionally northward in Bay to region of the Patuxent.

STING RAY

Dasyatis hastata, (De Kay)

Trygon hastata, De Kay, N. Y. Fauna, Fishes 73, pl. 65, fig. 214 ♀, Rhode Island.

Differs from *D. centrura* in having a rather broad fold above, on the tail, as well as below, both black. Disk quadrangular. Small pale spot on forehead. Disk 15 inches long.

Maryland localities: Somerset County.

SOUTHERN STING RAY

Dasyatis say, (Le Sueur)

Raja say, Le Sueur, Jour. Ac. Nat. Sci., Phila. I, 42, 1817 New Jersey.

Disk quadrangular, 1/6 wider than long, anterior margins nearly straight, posterior and inner borders convex outer and posterior angles rounded. Snout not protruding beyond the lines of the margin. Ventrals rounded. Tail strong, rather more than 1½ times the length of the disk with a strong serrated spine bearing a short low cutaneous expansion behind the spine on the upper side and a longer little wider one below, ending nearly opposite. Upper jaw undulated, lower prominent in the middle. Teeth small, smooth in young and females, sharp in adult males. Three papillæ at the bottom of the mouth and one at each side. Color olive brown in adult, young reddish or yellowish, lower surface whitish. Closely resembles the European species *D. pastinaca.* Carolina to Brazil, common in Florida, occasional northward to New York.

Maryland localities: Worcester county.

BUTTERFLY RAY

Pteroplatea maclura, (Le Sueur)

Raia maclura, Le Sueur, Jour. Ac. Nat. Sci., Phila., 1817, 41, Rhode Island.

Disk scarcely twice as broad as long, covered with perfectly smooth skin. Tail about ⅓ as long as the disk, with a very slight dermal fold above and below. Snout a little projecting, so that the anterior edge of each pectoral is somewhat concave. Color brownish olive, finely marbled with grayish and finely speckled; anterior edge of disk with half spots of paler, tail with four dark blotches above forming half rings. Long Island to Brazil, not uncommon on the Carolina coast.

Maryland localities: Worcester county.

Family Myliobatidæ

THE EAGLE RAY

Myliobatis freminvillei, (Le Sueur)

Myliobatis freminvillei, Le Sueur, Jour. Ac. Nat. Sci., Phila., IV, 111, 1824. Rhode Island.

Disk broader than long, the breadth equal to the length of the tail. Ventral fins much narrower than in *M. californicus.* Skin entirely smooth. A blunt whitish prominence over each eye. Muzzle prominent. Teeth of the main row four to six times as broad as long; small teeth in three rows. Reddish brown, tail nearly black. Cape Cod to Brazil; not uncommon.

Maryland localities: Worcester county and Chesapeake Bay.

COW-NOSED RAY

Rhinoptera bonasus, (Mitchill)

Raja bonasus, Mitchill, Trans. Lit. and Phil. Soc., N. Y., I, 1815, 479, New York.

Disk one-third broader than long, anterior borders almost straight, posterior undulated, muzzle deeply emarginate, teeth in seven rows in each jaw, the median teeth above four times as broad as long, the others gradually diminishing outward. Tail very slender, a little longer than the disk. Skin smooth, or nearly so. Color brownish. Cape Cod to Florida; not rare, feeds on mollusks.

Maryland localities: Worcester county.

Family **Mobulidæ**

SEA DEVIL; DEVIL-FISH; MANTA

Manta birostris, (Walbaum)

Raia birostris, Walbaum, Artedi Piscium, III, 535, 1792, after Diabolus marius, Willughby, etc.

Disk not quite twice as broad as long. Tail about as long as the disk. Teeth in about 100 longitudinal series, which are separated by distinct interspaces. Skin of body and tail everywhere covered with small stellate tubercles, rendering the surface very rough. Brownish, the margins of the disk darker. Tropical waters of America; north to New Jersey and San Diego; not rare on the Florida coast. Reaches a width of about twenty feet, one of the most enormous of aquatic vertebrates.

Maryland localities: Worcester county.

Family **Acipenseridæ**

COMMON STURGEON

Acipenser sturio, (Linn)

Acipenser sturio, Linn., Syst. Nat., ed. X, 1758, 237.

Shields not strongly striated; stellate plates small, in about ten rows, with smaller ones interspersed; last dorsal shield moderate, more than one-half length of one before it. Snout rather sharp, nearly as long as the rest of the head, becoming comparatively shorter and blunter with age. Barbels nearly midway between mouth and tip of snout, shortish, not reaching the mouth. Gill rakers small, slender, pointed, sparse, not longer than the pupil. Fulcra roughish, not enlarged. Lower lobe of tail rather sharp. Anal more than one-half dorsal, placed mostly below it. Anterior rays of pectoral thickened. D. 38; A. 27. Dorsal plates 10 to 14, lateral 29 (27 to 36); ventral plates, 9 (8 to 11). Olive gray, paler below. Atlantic coasts; ascending rivers of northern Europe and the United States.

The American Sturgeon (var. *oxyrhynchus*, Mitchill) has the number of lateral plates generally fewer (27 to 29 instead of 29 to 36 as in European examples). New England to Carolina; abundant.

Maryland localities: Anne Arundel, Baltimore, Calvert, Wicomico, Somerset, Dorchester, Queen Anne, Cecil, Harford and Worcester counties.

SHORT-NOSED STURGEON

Acipenser brevirostris, (Le Sueur)

Acipenser brevirostris, Le Sueur, Trans. Amer. Phil. Soc., I, 390, 1818.

Dusky above, paler below. Snout very short and obtuse, about one-fourth the length of the head. Barbels short, simple. Skin between rows of shields with many rows of small prickle-like plates; last dorsal shield very small, less than one-half the one before it. Shields rather large and smoothish. Anal about half dorsal and entirely below it. Dorsal shields 11 (8 to 11); lateral 32 (22 to 33); ventral 9 (6 to 9); D. 41; A. 22. Cape Cod to Florida, rare northward, extending further southward than other species.

Maryland localities: Potomac River.

Family **Lepisosteidæ**

THE GAR PIKE

Lepisosteus osseus, (Linnæus)

Esox osseus, Linn., Syst. Nat., ed. X, 1758, 313, after Artedi; based on *Acus maxima squamosa viridis*, the Green Gar Fish of Catesby 1738, pl. 30, Virginia.

Snout a little more than twice the length of the rest of the head, its length fifteen to twenty times its least width. Olivaceous, pale and somewhat silvery

below. Vertical fins and posterior part of the body with round blackish spots which are more distinct in the young; very young with a blackish lateral band. Head three in length; depth 12. D. 8; A. 9; V. 6; P. 10. Lat. line about 62. Length about five feet. Great Lakes and rivers of the United States from Vermont to the Rio Grande; generally abundant and quite variable, the local variations having given rise to many specific names. Southern specimens are often more distinctly spotted.

Maryland localities: Baltimore, Cecil, Harford, Dorchester, Calvert, Wicomico, Worcester, St. Mary's, Prince George and Somerset counties.

Family **Amiatidæ**

BOWFIN

Amiatus calvus, (Linnæus)

Amia calva, Linnæus, Syst. Nat., ed. XII, 1766, 500, Charleston, S. C.

Dark olive or blackish above, paler below; sides with traces of dark reticulate markings; lower jaw and gular plate often with round blackish spots; fins mostly dark, somewhat mottled. Male with a round black spot at base of caudal above, this surrounded by an orange or yellowish shade; in the female this ocellus is wanting. Lateral line nearly median, directed slightly upward at each end. D. 48 (42 to 53); A. 10 to 12. V. 7. Lateral line 67 (65 to 70).

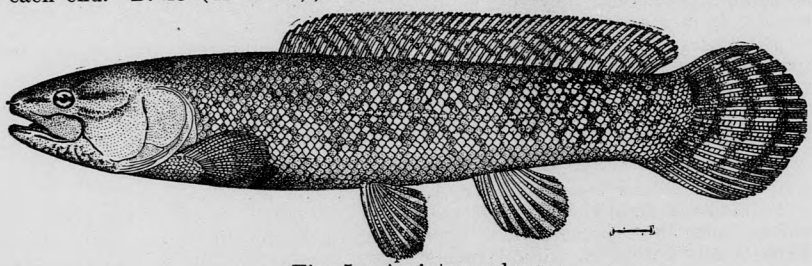


Fig. 5.—Amiatus calvus

Head 3¾ in length; depth 4 to 4½. Male about 18 inches in length, female 24 or more. Great Lakes and sluggish waters from Minnesota to Virginia, Florida, and Texas; abundant. A voracious and gamy fish of remarkable tenacity of life. The flesh is peculiarly soft and pasty and is of no value for food.

Maryland localities: One in the Academy of Natural Sciences of Philadelphia labeled "Maryland."

A specimen about 15 inches long, was shown B. A. Bean, at Marshall Hall, Md., by a colored man, who had caught it in the Potomac River, nearby.

Family **Tachysuridæ**

SEA CATFISH; GAFF TOPSAIL

Felichthys marinus, (Mitchill)

Silurus marinus, Mitchill, Trans. Lit. and Phil. Soc., N. Y., I, 1815, 433, New York.

Head rather short and broad, rounded anteriorly. Occipital buckler small, oblong, not much broader before than behind; band of palatine teeth nearly continuous, extremely variable. Maxillary barbels extending about to the end of the pectoral spine; pectoral spine longer than the dorsal spine, 2/3 the length of the head, its filament reaching the vent; dorsal filament reaching adipose fin; upper lobe of caudal much the longer; anal fin falcate. Dusky bluish, silvery below. Head 4¼. D. I, 7; A. 23; P. I, 12; B. 6. Vert. 20-30. Cape Cod to Texas; common southward; not valued as food.

Maryland localities: Worcester county and the lower Chesapeake Bay in Maryland.

Family **Ictaluridæ**

WHITE CAT; CHANNEL CAT OF THE POTOMAC

Ameiurus catus, (Linnæus)

Silurus catus, Linnæus, Syst. Nat., ed. X, 305. 1758; based on the catfish of Catesby. Northern part of America.

Body stout, slender in the young, the head becoming excessively broad in the adult. Barbels long, except nasal barbel; caudal fin deeply forked, the

upper lobe the longer. Humeral process more than one-half the length of the spine, extremely rugose. Anal rays 21 (19 to 22); base of anal 4½ to 5 in length. Dorsal fin inserted nearly midway between adipose fin and snout. Pale olive, bluish, silvery below without dark spots, but sometimes mottled or clouded. L. 2 feet. Delaware River to Texas, very common in the coastwise streams and swamps, especially about Chesapeake Bay and in Florida; also lately introduced into the Sacramento and San Joaquin rivers, where it is becoming abundant.

Maryland localities: Charles, Kent (Chestertown), Baltimore (Gunpowder River), Cecil, Harford and Montgomery counties.

YELLOW CAT

Ameiurus natalis, (Le Sueur)

Pimelodus natalis, Le Sueur, Mem. Mus. Hist. Nat., Paris, V, 154, 1819, North America.

Anal rays 24 to 27. Body more or less short and chubby, sometimes extremely obese (var. *natalis*), sometimes more elongate (var. *lividus*). Head short and broad; mouth wide, the jaws equal, or the upper jaw longest. Yellowish, greenish, or blackish. Great Lake region to Virginia and Texas, and southward; generally abundant, extremely variable, and running into several varieties.

Maryland localities: Montgomery county.

HORNED POUT; COMMON BULLHEAD; SMALL CATFISH; SCHUYLKILL CAT; SACRAMENTO CAT

Ameiurus nebulosus, (Le Sueur)

Pimelodus nebulosus, Le Sueur, Mem. Mus. Hist. Nat. Paris, V, 149, 1819, Lake Ontario.

Body rather elongate; depth 4 to 4½ in length. Anal fin usually with 21 or 22 rays; dorsal fin inserted rather nearer adipose fin than end of snout. Upper jaw usually distinctly longer than lower. Humeral process more than one-half the length of pectoral spine, which is rather long. Color dark yellowish brown, more or less clouded, sometimes yellowish, sometimes

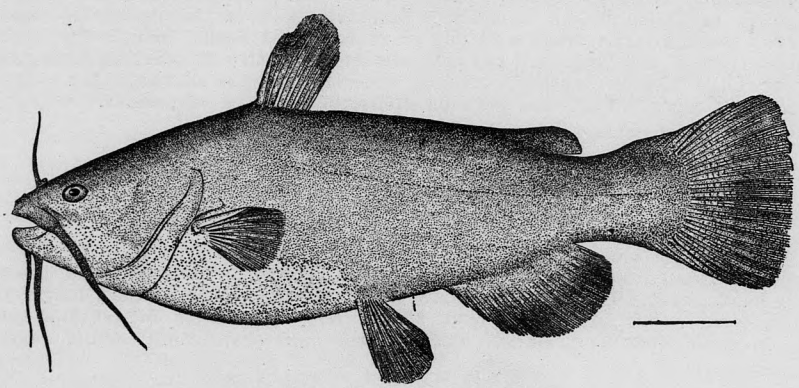


Fig. 63.—Ameiurus nebulosus

nearly black. L. 18 inches. Great Lakes, Ohio Valley, eastward to Maine, southwestward to Texas, and southeastward to Florida. The common bullhead, or Horned Pout of the north and east, abundant in every pond and stream; also introduced about 1877 into the Humboldt, Sacramento, San Joaquin and Gila Rivers, where it is now excessively abundant. Variable.

Maryland localities: Anne Arundel, Baltimore, Caroline, Cecil, Harford, Kent, Montgomery, Prince Frederick, Prince George, Wicomico and Worcester counties.

MISSISSIPPI CAT FISH

Ameiurus ponderosus, (Bean)

Amiurus ponderosus, Bean, Proc. U. S. Nat. Mus., 1879, 286, St. Louis, Mo.

The giant cat fish of the Mississippi River, has been successfully introduced into the Potomac by the United States Bureau of Fisheries, and examples of large sizes have already been taken in the deep channel between Georgetown and the Chain Bridge. Records of eleven, twenty-three and thirty-two pound fish have come to our notice, and one huge fish has been hooked by several anglers, but has proven too heavy for the tackle used.

Mr. E. D. Reid, of the National Museum, called our attention to a specimen recently caught and exhibited on one of the fish stalls of Louisiana Avenue, and this was secured by him and presented to the Museum. Its weight was eleven pounds. The head and skin of this fish has been preserved for the collections of the Museum. Upon a detailed examination it was found to be *A. ponderosus* described by Dr. Tarleton H. Bean in the proceedings of the United States National Museum, 1879, a cast of which is preserved in the Museum. The *Ameiurus anguilla* described in Bull. U. S. Fish. Comm., 1897, is undoubtedly the young of this form. *A. ponderosus* differs from *nigricans* in a deeper body, wider mouth, greater interorbital space, longer intermaxillaries, shorter maxillary barbels, being two-thirds as long as the head instead of six-sevenths as in *nigricans*, the smaller eye the long diameter of which is contained seventeen and one-half times in the length of the head, instead of nine to eleven as in *nigricans*. The caudal rays are shorter, and the caudal not forked, the pectoral considerably less than one-half as long as the head, while in *nigricans* it is more than one-half. The shape of the head resembles that of *nigricans*, the caudal however, is emarginate and not deeply forked, being a true Ameiurus.

TADPOLE CAT

Schilbeodes gyrinus, (Mitchill)

Siluris gyrinus, Mitchill, Amer. Month. Mag., 1818, 322, Walkill River, New York.

Body comparatively short and thick. Head large, its width 3½ to 4½ in length of body; depth 4 to 5½; head 3½ to 4. Spines stout and rather long; that of the pectoral fin straight, not serrated, grooved behind, 2⅓ in the distance from snout to dorsal fin. Dorsal higher than long, inserted nearer anal than snout. Anal 13. Jaws nearly equal. Humeral process short. Nearly uniform yellowish brown, sometimes blackish, without transverse blotches; a narrow dark lateral streak and one or more dorsal ones. Length five inches. Hudson River and westward through almost the entire Mississippi Valley, and upper Lake Region; rather common, especially northwestward; the western specimens more robust and perhaps distinguishable as var. *sialis*.

Maryland localities: Baltimore county.

MAD TOM

Schilbeodes insignis, (Richardson)

Pimelodus insigne, Richardson, Fauna Bor. Amer., III, 32, 1836, locality not known.

Body rather elongate. Pectoral spine moderate, about two in head, retrorse serrate without, weakly serrate within. Head broad and flat, upper jaw projecting; head about 4¼ in length; depth 6. Dorsal fin ¼ higher than long. Distance from snout to dorsal about 2¾ in length. Length of pectoral spine 2¾ in same distance. Dorsal much nearer anal than snout. Anal rays 14

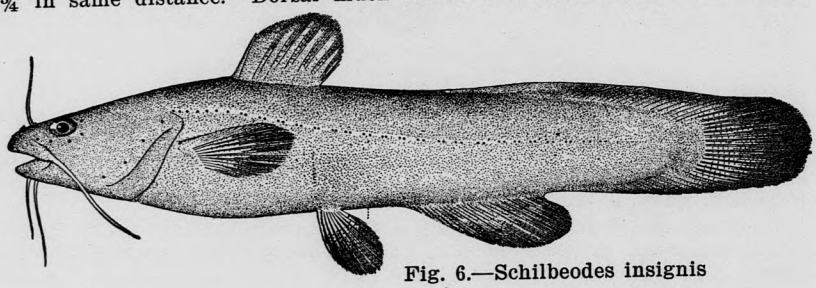


Fig. 6.—Schilbeodes insignis

to 16. Humeral process conspicuous, sharp. Color dark brown, somewhat mottled, fins all broadly and conspicuously dark-edged. One of the largest species, reaching the length of nearly a foot. Pennsylvania to South Carolina; very common in streams east of the Alleghenies.

Maryland localities: Baltimore, Harford, Prince George and Montgomery counties. Likely *Noturus flavus* of Uhler and Lugger from the Potomac and Patapsco, is really this species.

MISSISSIPPI CATFISH; WHITE CAT; SILVER CAT

Ictalurus punctatus, (Rafinesque)

Siluris punctatus, Rafinesque, Amer. Month. Mag., 1818, 359, Ohio River.

Olivaceous, rarely blackish, the sides silvery, almost always with small round dark olive spots; eye large, not wholly in front of middle of head; mouth small; barbels long; spines strong, serrate; head 4; depth 5. Length three feet. Montana to Vermont, Georgia, and Mexico, very abundant in flowing streams. A handsome fish, the best in the family as food.

Maryland localities: Montgomery and Washington counties.

CHUCKLE-HEADED CAT

Ictalurus furcatus, (Valenciennes)

Pimelodus furcatus, Le Sueur, in Hist. Nat. Poiss., IX, 136, 1840, New Orleans.

Silvery, nearly plain; eye small, wholly before middle of head; head 4¼; depth 5. Mississippi Valley, not uncommon. Anal fin very long; its rays 32 to 35; its base nearly ⅓ of body.

Size rather large, reaching a weight of over 40 pounds. Introduced east of the Alleghenies, along with other western forms.

Maryland localities: Atlantic drainage.

Family **Cyprinidæ**

RED-BELLIED DACE

Chrosomus erythrogaster eos, (Cope)

Chrosmus eos, Cope, Proc. Ac. Nat. Sci. Phil., 1861, 523, Meshoppen Creek. Susquehanna County, Pa.

Head 4; depth 5. D. 8; A. 8. Lateral line 77; teeth 5-5. Body slenderer than the preceding, the lateral line less distinct, often entirely wanting. Male with the two black lateral bands uniting on the caudal peduncle, the lower broader and decurved, the upper narrow and straight. Length 2½ inches. Susquehanna River.

Maryland localities: Recorded from Stony Run in the Patapsco Basin and the upper Potomac in Washington County, by Uhler and Lugger.

SILVERY MINNOW

Hybognathus nuchalis, (Agassiz)

Hybognathus nuchalis, Agassiz, Amer. Jour. Sci. & Arts, 1855, 224, Quincy, Ill.

Head 4½ to 5, depth 4⅛; eye 4. D. 8; A. 7; teeth 4-4. Scales 5-38-4. Body elongate, comparatively slender. Head moderate, rather short, the profile evenly curved, suborbitals broad, the anterior about twice as long as deep. Eye moderate, rather longer than muzzle. Upper jaw heavy, lower jaw thin. Scales large and silvery. Lateral line decurved; 12 to 14 large scales in front of dorsal. Intestines very long, 7 to 10 times length of the body. Olivaceous green above, translucent in life, sides clear silvery with bright reflections; fins unspotted, coloration becoming dusky in specimens living in dark waters. Length 4 to 7 inches. A graceful minnow, abundant in clear streams from the Delaware and Neuse to the upper Missouri and southward to Georgia and Texas, common in or near large rivers.

Maryland localities: Anne Arundel, Baltimore, Cecil, Harford, and Montgomery counties.

BLUNT-NOSED MINNOW

Pimephales notatus, (Rafinesque)

Minnilus notatus, Rafinesque, Ichth. Oh., 47, 1820, Ohio River.

Head 4½, depth 5; D. I, 8; A. 7. Scales 6-45-4; teeth 4-4. Body rather elongate, not elevated, moderately compressed. Head moderate; the muzzle

blunt and convex, top of the head depressed. Cheeks vertical. Mouth small, inferior, horizontal. Fins small; the dorsal moderate, the first ray distinct and spine-like in the male; slender in the female and small, caudal fin short. Scales moderate, deep, closely imbricated, scales in front of dorsal small and crowded in 23 rows. Eye moderate. Color olivaceous, little silvery, sides bluish, a black spot on the dorsal fin in front near the base. A dusky shade at base of caudal, fins often reddish, males in spring with the black on the dorsal more extended and the head wholly black. Snout with about 14 disproportionately large tubercles. Length four inches. Quebec to Delaware, Kentucky, Alabama, Arkansas and northward to the Dakotas. Generally very abundant in small streams west of the Alleghenies.

Maryland localities: Montgomery and Pipe Cr., Carroll county.

FALL FISH; SILVER CHUB; CORPORAL

Semotilus bullaris, (Rafinesque)

Cyprinus bullaris, Rafinesque, Amer. Month. Mag., II, 120, Dec., 1817.

Head 4; depth 4; eye 4½. D. 8; A. 8; scales 8-45-4; teeth 2, 5-4, 2. Body oblong, robust, little compressed. Head large, convex, the snout bluntly conic; mouth large, terminal, somewhat oblique, the lower jaw included; premaxillary below the level of the eye; the maxillary barely reaching the front of orbit. Eye moderate, rather high up and anterior. Barbel shorter than pupil, not evident in young specimens. Scales large, 22 in front of dorsal, not much crowded anteriorly. Dorsal fin slightly behind middle of body, just behind ventrals, inserted behind 13th. vertebra. Fins moderate. Coloration brilliant; steel-blue above; sides and belly silvery; males in spring with the belly and lower fins rosy or crimson; no spots on the fins. Length 18 inches. Abundant from the St. Lawrence to the James, east of the Alleghenies, in clear, swift streams, rock pools, below cataracts, and in clear lakes; not found west of the Alleghenies. It is much the largest of the eastern Cyprinidæ, ranking with the western and some European forms.

Maryland localities: Cecil, Frederick, Harford and Montgomery counties.

HORNED DACE; CREEK CHUB

Semotilus atromaculatus, (Mitchill)

Cyprinus atromaculatus, Mitch., Amer. Month. Mag., II, 1818, 324, Wallkill River, N. Y.

Head 3¾, depth 4; eye about 5. D. 7; A. 8. Scales 9-55-6, those in lateral line varying from 50 to 60 or even more, the number greatest in northern examples. Teeth 2, 5-4, 2. Body stout, the body tapering backwards from a point considerably in advance of the dorsal, so that the base of that fin is oblique. Head large and heavy, broad and rounded above; snout broad; mouth broad, oblique, lower jaw slightly included, the upper lip just below level of

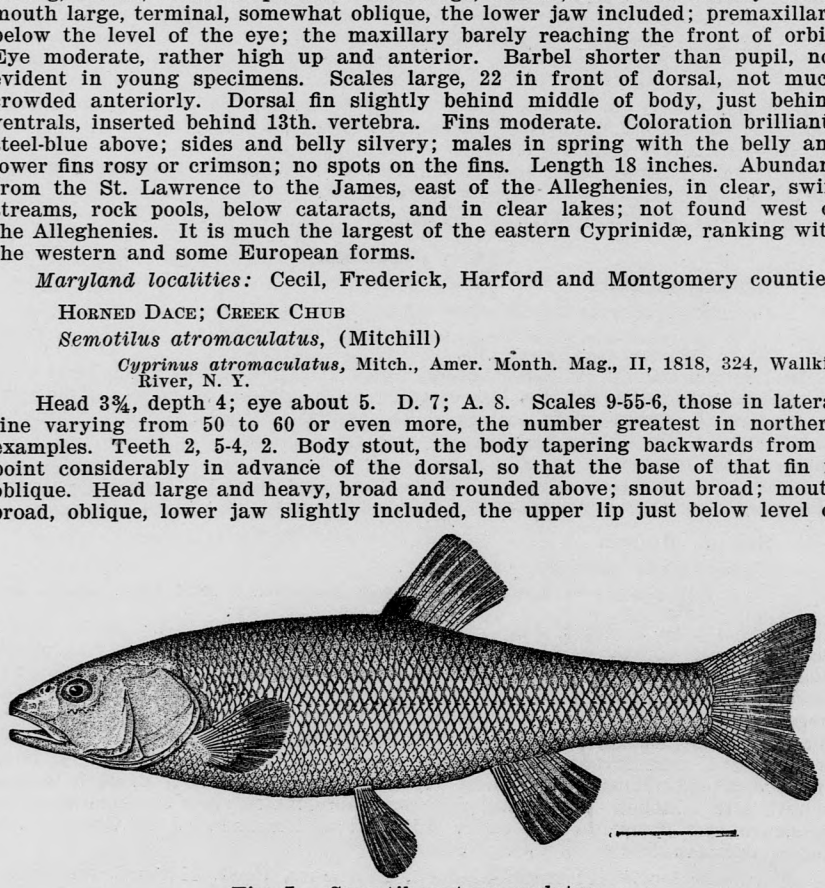


Fig. 7.—Semotilus atromaculatus

pupil. Maxillary barely reaching front of pupil. Eye rather small. Scales small, and considerably crowded and reduced anteriorly, about thirty series in front of the dorsal fin. Lateral line considerably decurved. Fins small. Color dusky, bluish above, sides with a vague, dusky band, black in the young, disappearing in the adult, belly creamy, rose tinted in males in spring. Young

with a small black caudal spot. Length 10 inches. Maine (Freeport; Kendall-Smith) and western Massachusetts (Housatonic River, Jordan), to southern Missouri, Wyoming, and Canada, everywhere abundant; chiefly in small brooks where it is often the largest and most voracious inhabitant.

Maryland localities: Cecil, Frederick, Garret, Harford, Montgomery and Prince George's counties.

PEARL DACE.
Leuciscus margarita, (Cope)
Clinostomus margarita, Cope, Cypr. Penn., 377, 1866, Conestoga Creek, Lancaster, Pa.

Head 4, depth 4¼. D. 8; A. 9. Scales 11-52 to 58-8; teeth 2-5-4, 2. Body stout and thick, little compressed, the back somewhat elevated. Caudal peduncle thick. Head blunt, thick and rounded. Mouth small, terminal, oblique, the upper lip below the orbit; eye rather large; scales rather small. Lateral line decurved, more or less incomplete, the pores usually ceasing behind middle of body. Fins rather large. Dorsal fin posterior. Coloration above dusky olive, dusted with dark specks, sides plumbeous silvery; forming a narrow streak on tail, belly white, crimson in spring males, snout dusky, fins plain, scales punctuate. Length three inches. Susquehanna River to James River, not common, also taken in the headwaters of the Kanawha. A handsome little fish.

Maryland localities: Carroll and Montgomery counties.

ROSY-SIDED DACE.
Leuciscus vandoisulus, (Valenciennes)
Leuciscus vandoisulus, Valenciennes, Hist. Nat. Poiss., XVII, 317, 1844, South Carolina.

Head 3⅔ to 4¼, the largest specimens most elongate, the females deeper; eye moderate, 3½. D. 9; A. 8; lateral line 48 to 53; teeth 2, 5-5, or 4, 2. Body oblong, deep and compressed. Head rather large. Mouth large, oblique, the lower jaw projecting, the mandible extending to the pupil. Lateral line decurved. Color bluish green, some of the scales of the back irregularly darker, producing a mottled appearance; a dark lateral band with a pale streak above it in the adult, young nearly plain; males in spring with the region behind the head and above the pectorals as far back as the anal of a bright rose-red, brightest anteriorily. Length 5 inches. Streams about Chesapeake Bay to Georgia; abundant in the clear, swift brooks east of the Allegheny Mountains, also in tributaries of the Tennessee and Cumberland, west of the mountains.

Maryland localities: Baltimore, Carroll, Cecil, Harford, Prince Georges and Montgomery counties.

GOLDEN SHINER; BITTER-HEAD; ROACH; BREAM
Notemigonus crysoleucas, (Mitchill)
Cyprinus crysoleucas, Mitchill, Rept. Fish. N. Y., 23, 1814, New York.

Head 4½; depth 3; eye moderate about four in head. D. 8; A. 13, (12 to 14). Scales 10-46 to 55-3; teeth 5-5. Body moderate elongate, strongly compressed.

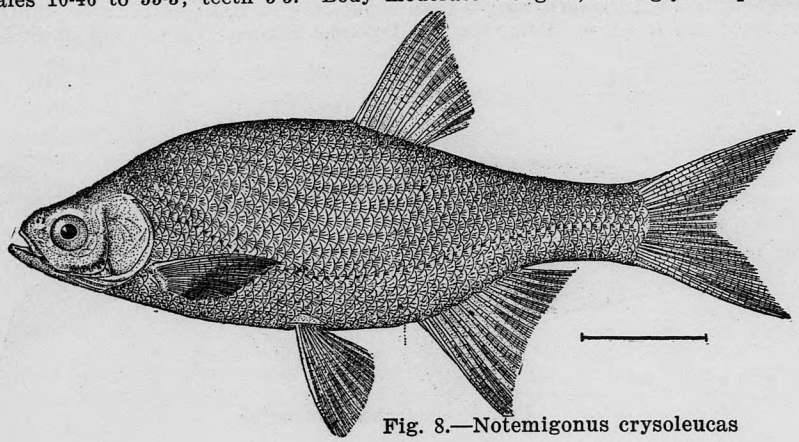


Fig. 8.—Notemigonus crysoleucas

Head short, subconic, compressed, the profile somewhat concave. Mouth small, oblique, the upper lip on level of upper part of pupil, the maxillary not reaching front of eye. Fins medium. Color clear greenish above, sides silvery, with bright golden reflections; fins yellowish, the tips of the lower fins sometimes slightly orange in spring males. Length 12 inches. Nova Scotia and Maryland to Dakota and Texas, everywhere abundant in bayous and weedy ponds. One of the most familiar and characteristics of our Cyprinidæ.

Maryland localities: Anne Arundel, Baltimore, Caroline, Cecil, Harford, Montgomery, Wicomico and Worcester counties.

BRIDLED MINNOW

Notropis bifrenatus, (Cope)

Hybopsis bifrenatus, Cope, Cypr. Penn., 384, 1866, Schuylkill River, Conshohocken, Pa.

Head 4 1/5; depth 4 1/5; eye 3. D. 8; A. 7. Scales 5-36-3; teeth 4-4. Body rather slender, the caudal peduncle somewhat contracted. Head moderate, the muzzle very obtuse. Mouth oblique, the jaws about equal, upper lip opposite lower part of pupil. Eye large, longer than snout. Lateral line developed for a very short distance, thirteen scales before dorsal. Straw colored, the scales brown edged above, a shining black band from snout through eye to caudal; this includes the edge of the lower jaw; an orange band above this on the snout; regions below the black band silvery. Length 1½ to 2 inches. Massachusetts to Maryland, coastwise, not common. A small, but handsomely colored species.

Maryland localities: Anne Arundel, Cecil, Harford, Kent and Prince Georges counties.

SWALLOW MINNOW

Notropis procne, (Cope)

Hybognathus procne, Cope, Proc. Ac. Nat. Sci., Phila., 1864, 279, Delaware River, Schuylkill River, Conestoga River, White Clay Creek, Pa.

Head 4¾; depth 5¼. Scales 5-32 to 34-3; teeth 4-4; A. 7. Body slender with long caudal peduncle, the back higher and the tail slenderer than in *N. blennius*, the profile steeper. Snout obtuse, the mouth horizontal, inferior, small. 13 rows of scales in front of dorsal. Dorsal higher than in *N. blennius*, its first rays as long as head. Eye large. Olivaceous; a dark dorsal line and a plumbeous lateral band overlying black pigment; fins unspotted, sometimes very pale. Length 2½ inches. Delaware River and southward, in coastwise streams, as far as the Neuse; very common. One of the smallest of the Cyprinidæ.

Maryland localities: Harford, Montgomery and Washington counties.

SPAWN-EATER

Notropis hudsonius amarus, (Girard)

Hudsonius amarus, Girard, Proc. Ac. Nat Sci., Phila., 1856, 210, Chesapeake Bay, Potomac River at Washington.

Very close to var. *hudsonius*, characterized by the longer and less obtuse head, 4½ to 4⅗ in length, longer than snout; the caudal spot faint or wanting, and the teeth 1, 4-4, 0. Delaware and Potomac Rivers. This is not unlikely a

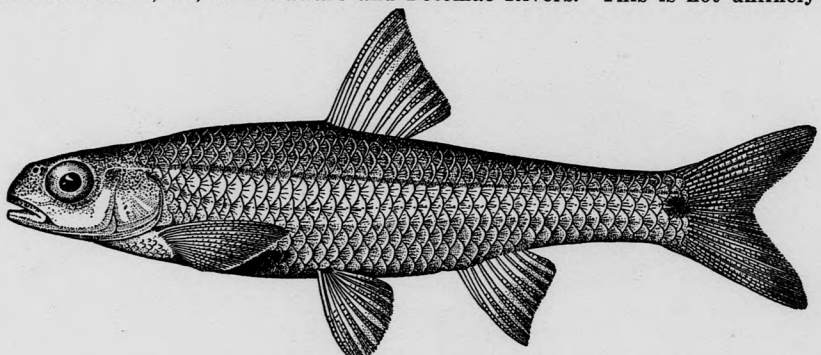


Fig. 9.—Notropis hudsonius

distinct species, as Abbott has contended, but there is some evidence of its intergradation with hudsonius.

Maryland localities: Baltimore, Caroline, Cecil, Charles, Harford, Kent and Montgomery counties.

SILVER-FIN

Notropis analostanus, (Girard)

Cyprinella analostanus, Girard, Proc. Ac. Nat. Sci. Phila., 1856.

Head 4½, depth 4 in adult males; females and young more slender, 4½ to 5; eye small, 4½ in head. D. 8; A. 8. Scales 5-38 to 40-3; teeth 1, 4-4, 1, the edges more or less distinctly serrate. Body moderately elongate, somewhat compressed, the dorsal and ventral outlines regularly and gently arched. Head rather short and deep. Mouth rather small, quite oblique, the lower jaw received within the upper when the mouth is closed. Leaden silvery, bluish in the males, edge of scales dusky, a dark vertebral line, a large black spot on the upper posterior part of the dorsal. Paired fins and lower part to the belly as well as the tips of the anal and caudal, and the front and upper parts of dorsal, charged with clear, satin white pigment in males in spring; in full breeding dress the dorsal pigment with a greenish luster, no creamy band at base of caudal, males with the head and front covered wih small tubercles.

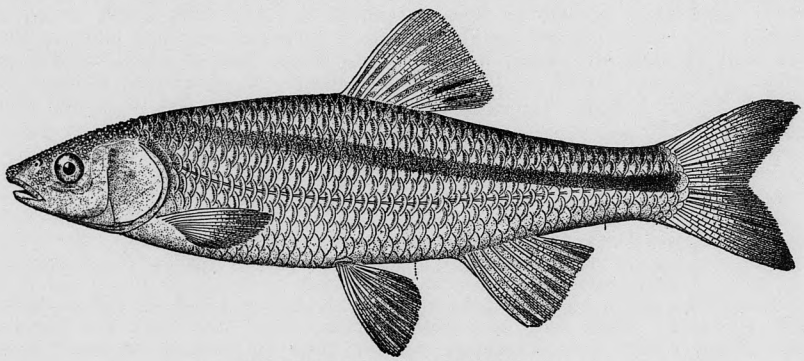


Fig. 10.—Notropis analostanus

Length 4 inches. Central New York, Cayuga Lake, to Minnesota, northern Alabama and Arkansas, in clear streams, very abundant in the Ohio Valley.

Maryland localities: Baltimore, Cecil, Harford, Prince George and Montgomery counties. Originally described from the Potomac and Analostan Island, D. C.

SHINER; RED-FIN; DACE

Notropis cornutus, (Mitchill)

Cyprinus cornutus, Mitchill, Amer. Month. Mag. Crit. Review, I, July, 1817, 289, Wallkill River, New York.

Head 4¼, depth 3¼, varying much with age; eye 4 to 5. D. 8; A. 9. Scales 6-41-3; teeth 2, 4-4, 2, with rather narrow grinding surface. Body elongate in the young, in the adult short, compressed with the anterior dorsal region much swollen and gibbous. Head rather heavy, compressed, rounded between the eyes, the snout bluntish. Mouth moderate, nearly horizontal, the jaws nearly equal, the lower somewhat included. Eye moderate, maxillary scarcely reaching front of eye, the premaxillaries below the level of eye. Scales always deeper than long on the sides, becoming extremely deep in the adult. Lateral line decurved. Dorsal moderate, inserted directly over ventrals in young, thrown somewhat backward in adult by the growth of the nuchal region. Pectorals barely or not reaching the ventrals, the latter about to vent. Region in front of dorsal typically with about twenty-three scales, the number ranging from fifteen to forty. Coloration dark steel blue above, the scales with dusky edges,

the bases also dusky; a gilt line along the back and one along each side, these distinct only when the fish is in the water; belly and lower part of the sides silvery, bright rosy in spring males; dorsal fin somewhat dusky, other fins plain. Head dark above, a dark shade behind scapula, lower jaw and region in front of dorsal to tip of snout covered with small tubercles in spring males, female and young fishes are plain olivaceous above and silvery below. Length 5 to 8 inches. Entire region east of the Rocky Mountains excepting the South Atlantic States and Texas; almost everywhere the most abundant fish in small streams.

Maryland localities: Baltimore, Cecil, Harford, Prince George and Montgomery counties.

Iron-colored Minnow

Notropis chalybœus, (Cope)

Hybopsis chalybœus, Cope, Cypr. Penn., 383, 1866, Schuylkill River, Pennsylvania.

Head 3 4/5; depth 5; eye large, 3 in head. D. 8; A. 8. Scales 6-33-3; teeth 2, 4-4, 2. Body moderately elongate, the back a little elevated with slender caudal peduncle. Head flat above, rather narrow, muzzle rather pointed. Mouth very oblique, the lower jaw the longer. Lateral line decurved. Dorsal inserted behind ventrals; dorsal and anal very short and high; pectorals and ventrals short; 16 to 18 scales in front of dorsal. Color dark, a broad black shining lateral band from muzzle to base of caudal, a light band above it on the muzzle; belly straw colored, bright orange in spring males; fins plain, a small dark spot at base of caudal; a dark streak along base of anal. Length two inches. Delaware River to the Ogeechee River; in coastwise streams and swamps, rather scarce. Strongly resembles *N. bifrenutus*, the teeth and scales of back different.

Maryland localities: Wicomico and Worcester counties.

Emerald Minnow

Notropis atherinoides, (Rafinesque)

Notropis atherinoides, Rafinesque, Amer. Month. Mag. & Crit. Rev., 1818, 204, Lake Erie.

Head 4⅔; depth 5½; eye 3¼. D. 8; A. 11. Scales 5-38-3, 15 before dorsal; teeth 2, 4-4, 2. Body long and slender, compressed, the back not elevated. Head blunt, conic, proportionately shorter than in related species. Mouth moderate, very oblique, upper lip on level of upper part of pupil; maxillary about reaching front of eye. Eye large, rather longer than snout. Fins low, dorsal well behind ventrals; tips of ventrals extending to beyond middle of dorsal. Lateral line decurved. Color translucent green above, sides bright silvery, scales above faintly punctuate, but not enough so to render them dark edged, nor to form blotches along sides; a faint dark vertebral line. Males in spring with the snout rosy. Length four to six inches. Great Lake region and Ohio and Mississippi Valleys and north to Winnepeg. Abundant in lakes, quiet places and river channels; very variable. Next to *N. arge* the largest and handsomest species of this type.

Maryland localities: Carroll and Montgomery counties.

Attractive Minnow

Notropis amœnus, (Abbott)

Alburnellus amœnus, Abbott, Amer. Nat., 8, 1874, 334, Raritan River, New Jersey.

Head 4; depth 5⅓ (4¾ to 5½); eye 3⅓. D. 8; A. 10. Scales 6-39-3. Close to *Notropis rubrifons*, but the scales before dorsal smaller as in *N. photogenis*. Body elongate, compressed, eye large, longer than snout. Mouth large, oblique, the jaws subequal, the maxillary to front of eye; 22 to 25, (rarely 18 to 20) scales before dorsal; lateral line much decurved. Dorsal high, behind ventrals; pectorals moderate. Translucent green, sides silvery, with sometimes a faint plumbeous band ending in an obscure plumbeous spot. Length 3¾ inches. Clear streams east of the Alleghenies from the Raritan to the Neuse; abundant.

Maryland localities: Cecil, Harford, and Montgomery counties.

SCALLOPED MINNOW

Ericymba buccata, (Cope)

Ericymba buccata, Cope, Proc. Ac. Nat. Sci., Phila., 1865, 88, Kiskiminitas River, a tributary of the Monongahela, western Pennsylvania.

Head 4; depth 5; eye large, 4 in head. D. 8; A. 8; scales 5-33-3; teeth 4-4, 0. Body fusiform, rather elongate, little compressed, the back not elevated. Head rather long, somewhat depressed above, with broad and prominent muzzle. Mouth rather small, horizontal subinferior, the lower jaw considerably shorter than upper; upper lip below level of pupil; maxillary not reaching to eye; dentary bones dilated, the mucous channels conspicuous. Suborbital very broad, silvery, with an elevated longitudinal ridge and conspicuous cross lines; opercle small. Fins small, dorsal over ventrals. Scales moderate, lateral line nearly straight, breast scaleless; 15 large scales before dorsal. Color olivaceous, rather pale, sides bright silvery with bluish reflections; a dark dorsal streak, conspicuous posteriorly; fins plain; males without tubercles or bright colors. Length three to five inches. Michigan and western Pennsylvania to Kansas and southward to West Florida. One of the most remarkable of our little minnows.

Maryland localities: Montgomery county.

LONG-NOSED DACE

Rhinichthys cataractæ, (Valenciennes)

Gobio cataractæ, Valenciennes, Hist. Nat. Poiss,, Vol. 16, 1842, 315, Niagara Falls.

Head 4; depth 5; eye 2 in snout, 5 in head. D. 8; A. 7; scales 14-65-8 (62 to 68); teeth 2, 4-4, 2. Body elongate, little compressed, not elevated. Head long, the muzzle flattened, narrowed, and extremely prominent, the mouth being entirely inferior and horizontal. Eye nearly median. Isthmus wide. Barbel evident. Pectoral fins enlarged in males. Insertion of dorsal nearly median. Color olivaceous, paler below, with numerous dusky punctulations; the back often almost black; some of the scales usually irregularly darker, producing a mottled appearance; no distinct black lateral band. Young specimens with a dusky lateral shade; a blackish spot on the opercle; males in spring with the lips, cheeks and lower fins crimson. Length five inches. New England to Virginia and Wisconsin; its varieties ranging to Utah and the Columbia Basin, frequenting clear and boisterous streams and rock pools.

Maryland localities: Prince George and Montgomery counties.

BLACK-NOSED DACE

Rhinichthys atronasus, (Mitchill)

Cyprinus atronasus, Mitchill, Trans. Lit. and Phil. Soc., N. Y., I, 1815, 460, Wallkill River; brooks of New York; Mitchill, Amer. Monthly Mag., 1, 1817, Dec., 289.

Head 4; depth 4½; eye 1½ in snout, 4½ in head. D. 7; A. 7; lateral line 64; teeth 2, 4-4, 2. Body moderately elongate, little compressed. Head moderate, rather broad and flattish above. Snout moderate. Mouth small, horizontal, subterminal, the lower jaw included; barbel minute, but probably always present; upper lip on level of the lower part of pupil. Maxillary not reaching nearly to eye. Eye small, nearly median. Fins rather small, dorsal fin well back, its insertion about midway between nostril and base of caudal. Scales quite small, somewhat embedded. Color blackish above, some of the scales irregularly darker; a black band passing from snout through eye and along sides of body; a paler streak below this; belly silvery; males in spring with the lateral band and the lower fins, and sometimes the whole body, bright crimson; males in late summer with the lateral band scarlet or orange, the red color growing fainter later in season. Length three inches. New England to Minnesota, northern Alabama and Virginia. Very abundant in clear brooks and mountain streams.

Maryland localities: Baltimore, Carroll, Cecil, Garrett, Harford, Prince George, and Montgomery counties.

HORNY HEAD; RIVER CHUB; JERKER; INDIAN CHUB

Hybopsis kentuckiensis, (Rafinesque)

Luxilus kentuckiensis, Rafinesque, Ichth, Ohiensis, 1820, 48, Ohio River.

Head 4; depth 4¼. D. 8; A. 7; scales 6-41-4, 1, or 1, 4-4, 0, somestimes 4-4. Body rather robust, little elevated, not much compressed. Head large, rather

broadly rounded above; the snout conical, bluntish. Mouth rather large, the lower jaw somewhat the shorter; upper lip rather below level of eye; maxillary not reaching to front of eye. Eye small, median, high up. Barbel well developed. Suborbitals very narrow; preorbital large. Fins moderate; the dorsal rather posterior, slightly behind insertion of ventals; caudal broad, little forked. Scales large, not crowded anteriorly, 18 rows in front of dorsal. Lateral line somewhat decurved. Color bluish olive; sides with bright green and coppery reflections; a curved dusky bar behind opercle; scales above with dark borders; belly pale, but not silvery, rosy in spring males; fins all pale orange without black spot; males in spring with a crimson spot on each side of head; adults with the top of the head swollen forming a sort of crest which is sometimes a third of an inch higher than leval of the neck and is covered with large tubercles; young with a dark caudal spot. Length 6 to 9 inches. Pennsylvania to Wyoming and Alabama on both sides of the Alleghenies; everywhere abundant in the larger streams, seldom ascending small brooks; one of the most widely diffused of our *Cyprinidæ;* western specimens usually have the teeth in two rows. Variable.

Maryland localities: Baltimore, Cecil, Garrett, Harford and Montgomery counties.

CUT-LIPS; NIGGER CHUB; NIGGER DICK

Exoglossum maxillingua, (Le Sueur)

Cyprinus maxillingua, Le Sueur, Journ. Ac. Nat. Sci. Phila., I, 1817, 85, Pipe Creek, Md.

Head 4; depth 4½. D. 8; A. 7; scales 8-53-5; teeth 1, 4-4, 1. Body rather stout, little compressed. Head large, broad and flattish above, with tumid cheeks. Mouth moderate, slightly oblique, the end of maxillary not reaching line of orbit. Upper jaw longer than lower. Scales rather crowded anteriorly, those in front of dorsal small. Color olivaceous, smoky or dark above; a blackish bar behind opercle, and a dusky shade at root of caudal in young; fins unmarked. Length 6 inches. Lake Ontario, St. Lawrence River, Lake Champlain, Hudson River and Cayuga Lake and southward to Virginia; abundant in the basins of the Susquehanna, Hudson, Potomac, James, Roanoke and Kanawha, but not widely distributed. One of the most singular of the Cyprinidæ, distinguished at sight by its 3-lobed lower jaw.

Maryland localities: Baltimore, Cecil, Carroll, Garrett, Prince George, Howard and Montgomery counties. Originally described from Pipe Creek.

CARP

Cyprinus carpio, (Linnæus)

Cyprinus carpio, Linnæus, Syst. Nat., ed. X, 1758, 320.

Dorsal III, 20; A. III, 5; scales 5-385; teeth 1, 1, 3-3, 1, 1. Body stout, more or less compressed, heavy anteriorly. L. 18 inches or more. Fresh waters of Central Asia; introduced as a food-fish into Europe and America. In domestication it has run into many varieties, distinguished by differences in form, squamation, and development of fins.

Maryland localities: Baltimore, Carroll, Washington, Frederick, Cecil, Montgomery and Prince George counties.

GOLDFISH

Carassius auratus, (Linnæus)

Cyprinus auratus, Linnæus, Syst. Nat., ed. X, 1758, 323.

D. II, 18; A. II, 7; scales 26; teeth, 4-4. Body stout, covered with large scales. Dorsal and anal fins with the spines strong, coarsely serrated. Coloration olivaceous, usually orange, or variegated in domestication. Length 12 inches. China and Japan; introduced everywhere as an aquarium fish, and now naturalized in many of our eastern streams. The variations are innumerable.

Maryland localities: all counties.

TENCH

Tinca tinca, (Linnæus)

Cyprinus tinca, Linnæus, Syst. Nat., ed. X, I, 321, 1758.

The Tench was introduced into the United States from Europe. It prefers still waters in which aquatic plants abound, is very tenacious of life, and has

been observed to live a whole day out of water. Its food consists of insects, larvæ, worms and vegetable substances. Spawning takes place in June and July, the rate of growth being rapid, under favorable conditions, the young attaining to a weight of one pound in their first year. Weights of ten or eleven pounds are recorded and an exceptionally large Tench has been mentioned by Salvianus of 20 pounds weight.

Maryland localities: Ponds of the various parks, such as that in Druid Hill Park, Baltimore.

IDE; GOLDEN IDE

Idus idus, (Linnæus)

Cyprinus idus, Linnæus, Syst. Nat., ed. X, I, 324, 1758, fresh waters of Europe.

This species introduced from Europe where it is known as Orfe, or Gold Nerfling, has a more elongate and compressed body than the Gold Fish (*Carassius auratus*). It reaches a length of 18 or 20 inches, a weight of six pounds, and is only suitable for very large tanks, or ponds.

Dorsal, 11 to 12; Anal, 13 to 14; ventral, 10; scales 9 or 10, 56 to 59-7. The pharyngeal teeth are 5, 3-3, 5, hooked, not serrated.

Maryland localities: Ponds of the various parks, such as that in Druid Hill Park, Baltimore.

Family **Catostomidæ**

EASTERN CARP SUCKER

Carpiodes cyprinus, (Le Sueur)

Catostomus cyprinus, Le Sueur, Jour. Ac. Nat. Sci. Phila., I, 1817, 91, Elk River and other tributaries of Chesapeake Bay.

Very similar to *C. velifer,* the mouth similar but the opercle nearly smooth with scarcely any wrinkles or furrows. Body rather elongate. Eye quite small; dorsal fin high, color silvery, dorsal dusky; paired fins edged with white.

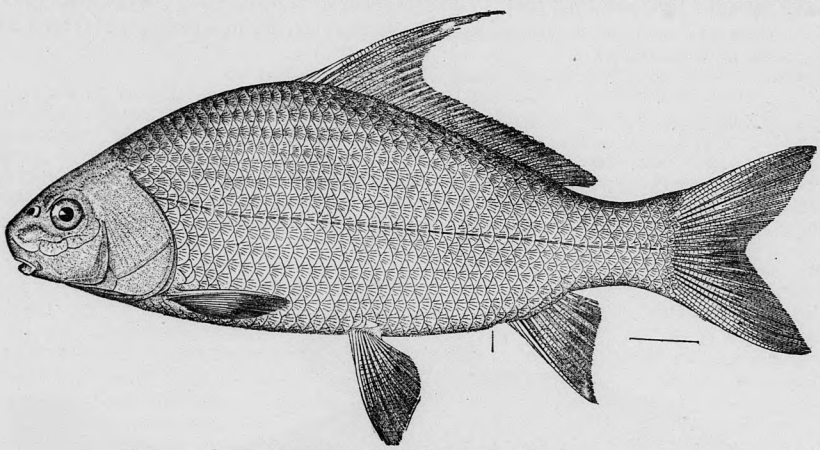


Fig. 11.—Carpiodes cyprinus

Streams about Chesapeake Bay, common in the Chesapeake and Potomac, rare in the Delaware.

Maryland localities: Cecil, Harford and Montgomery counties. Originally described from the fresh-water streams of Chesapeake Bay and the Elk River.

COMMON SUCKER; WHITE SUCKER; BROOK SUCKER; FINE-SCALED SUCKER

Catostomus commersonnii, (Lacépède)

Cyprinus commersonnii, Lacépède, Hist. Nat. Poiss., V, 502, 1803, locality unknown.

Body moderately stout, varying with age, subterete, heavy at the shoulders the depth 4 to 4⅔ in length. Head rather large and stout, conical, flattish

above, its length 4 to 4½ in body (3½ to 4¼ in young). Snout moderately prominent, scarcely overpassing the mouth. Mouth rather large; the lips strongly papillose, the upper moderate, with two or three rows of papillæ; 4 to 6 in specimens from eastern Colorado (var. *sucklii*). Scales crowded anteriorly, much larger on the sides than below; scales 10-64 to 70-9. Coloration oliva-

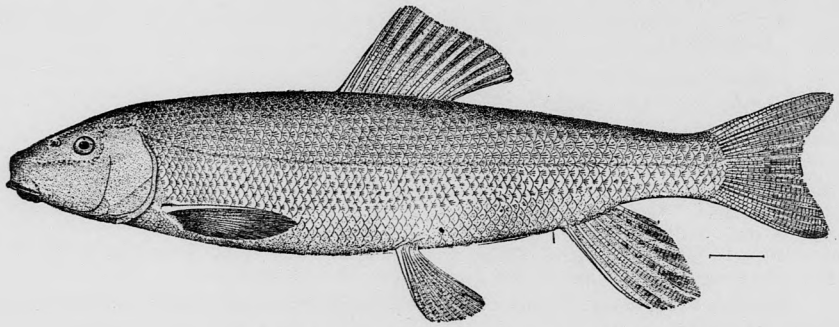


Fig. 12.—Catostomus commersoni

ceous; males in spring with a faint rosy lateral band; young brownish, more or less mottled, often with confluent blackish lateral blotches or a lateral band. Lateral line imperfect in the very young. D. usually 12. L. 18 inches. Streams and ponds from Quebec and the Great Lakes to Montana, Colorado, and southward to Missouri and Georgia; the commonest of the suckers, excessively abundant from Massachusetts west to Kansas. Variable; western specimens have broader lips and approach *C. ardens*.

Maryland localities: Baltimore, Cecil, Garrett, Prince George, Harford and Montgomery counties.

CHUB SUCKER

Erimyzon sucetta oblongus, (Mitchill)

Cyprinus oblongus, Mitchill, Trans. Lit. and Phil. Soc., N. Y., 1815, 1,459, New York.

Body more elongate and less compressed than in typical *sucetta*, the greatest depth being contained about 3¼ times in the length. Nape more gibbous than in *E. sucetta*, the usual number 43-15. Color dark olivaceous above; the

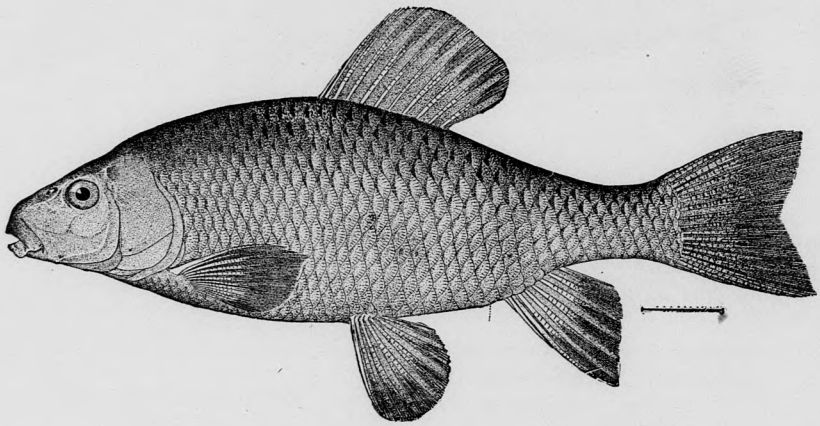


Fig. 13.—Erimyzon sucetta oblongus

adult nearly plain, the young with a distinct black lateral band which breaks up into bars with age. Great Lake region to Maine and the Dakotas, south to Virginia and Indian Territory, everywhere abundant in northern upland streams, gradually passing southward into the typical *sucetta*.

Maryland localities: Baltimore, Cecil, Harford, Prince Georges and Montgomery counties. In the Potomac and tributaries.

SPOTTED SUCKER

Minytrema melanops, (Rafinesque)

Catostomus melanops, Rafinesque, Ichthy. Ohien., 57, 1820, Ohio River.

Differs from *Erimyzon sucetta oblongus* in the interrupted lateral line. Each scale with dark basal spot. Reaches 18 inches.

Maryland localities: Harford county.

MULLET; RED-HORSE

Moxostoma macrolepidotum, (Le Sueur)

Catostomus macrolepidotus, Le Sueur, Jour. Ac. Nat. Sci. Phila., I, 1817, 94, Delaware River.

Head moderate, rather stout, its length 4⅗ in body; eye 1⅔ in snout; dorsal fin with its free edge concave. Scales usually with dusky shade at base; lower fins pale. Streams about Chesapeake and Delaware bays and southward to North Carolina. It seems in some respects intermediate between *M. aureolum* and *M. crassilabre*, but we cannot at present identify it with either.

Maryland localities: Cecil, Prince George, Harford, and Montgomery counties. Uhler and Lugger's record for *M. duquesnii* in Garrett county may really pertain to this species.

BLACK SUCKER

Hypentelium nigricans, (Le Sueur)

Catostomus nigricans, Le Sueur, Jour. Ac. Nat. Sci. Phila., I, 1817, 102, Lake Erie.

D. 10 or 11; V. 9. Lateral line 48 to 55, 12 to 15 scales in a cross series. Depth 4½ to 5 in length; head 4 to 4½. Eyes rather small; 4½ to 5 in head. Head flattened above, transversely concave between orbits, the frontal bone thick, broad and short, the physiognomy being therefore peculiar. Upper lip very thick, strongly papillose, with a broad free margin, which has upward of 8 to 10 series of papillæ upon it; lower lip greatly developed, strongly papillose, considerably incised behind. Fontanel shorter and smaller than in *C. commersonnii*. Pectoral fins unusually larger. Color olivaceous; sides with brassy luster; belly white; back brown, with several dark cross blotches, irregularly arranged, these becoming obsolete in old individuals; lower fins dull red, with some dusky shading; young considerably variegated, the sides spotted. Size large; length about two feet. New York to Minnesota and Kansas, Arkansas, and the Carolinas; abundant in swift or rocky streams, which it ascends to spawn; never found in muddy or warm waters; less tenacious of life than the other species of *Catostomus*.

Maryland localities: Baltimore, Cecil, Garrett, Harford, and Montgomery counties. Described as *C. maculosus* Le Sueur, from Pipe Creek, Carroll county, where the species is exceedingly abundant, especially on the gravelly bottom of Little Pipe Creek.

Family **Elopidæ**

TARPON; TEN-POUNDER

Elops saurus, (Linn.)

Elops saurus, Linnæus, Syst. Nat., ed. XII, 518, 1766, Carolina.

Head 4½; depth 5 to 6; eye large, 4 to 5. D. 20; A. 13; V. 15; B. 30. Scales 12-120-13. Gular plate three to four times as long as broad. Length three feet. Tropical seas; abundant and very widely distributed. Common in America north to Carolina and the Gulf of California, straying on the Atlantic coast to Long Island.

Maryland localities: Somerset, Worcester and St. Mary's counties.

THE TARPON

Megalops atlanticus, (Valenciennes)

Megalops atlanticus, Valenciennes, Hist. Nat. Poiss, XIX, 398, 1846. Guadeloupe, San Domingo, Martiniæ, Porto Rico.

Head 4; depth 3 4/5; maxillary large, reaches eye. D. 12; A. 20; scales 42. Dorsal filament longer than head. Bright silvery, back darker. Reaches 6 feet. Tropical Atlantic, north to Long Island.

Maryland locality: Somerset county.

Family **Hiodontidæ**

THE MOON-EYE

Hiodon tergisus, (Le Sueur)

Hiodon tergisus, Le Sueur, Jour. Ac. Nat. Sci., Phila., I, 1818, 364, Ohio River.

Head 4⅓; depth 3; eye 3; D. 12; A. 28. Scales 5-55-7. Vertebræ 30 plus 31=61. Body oblong, moderately compressed. Eye large, the maxillary barely reaching its middle. Pectoral fins not reaching ventrals, the latter just short of vent. Belly behind ventrals somewhat carinate, but not before ventrals. Color brilliantly silvery, olive-shaded above. Length 12 inches. Great Lakes and the Mississippi Valley; north to Assiniboine River, abundant in the larger streams. One of our handsomest fishes, not valued as food, the flesh being dry and full of small bones.

Maryland localities: Washington county.

Family **Dorosomidæ**

THE GIZZARD SHAD

Dorosoma cepedianum, (Le Sueur)

Megalops cepediana, Le Sueur, Jour. Ac. Nat. Sci., Phila., I, 1818, 361, Delaware and Chesapeake Bay.

Head 4⅓; depth 2½; eye 4½. D. 12; A. 31. Scales 56-23; scutes 17 plus 12. Body deep, compressed, the back elevated in the adults. Dorsal about median, slightly behind ventrals, its filamentous ray about as long as head, sometimes longer, sometimes shorter. Caudal widely forked, the lower lobe the longer. Silvery; bluish above; young with a round dark spot at the shoulder, tips of ventrals and edge of anal often dusky. Length 15 inches. Cape Cod to Mexico;

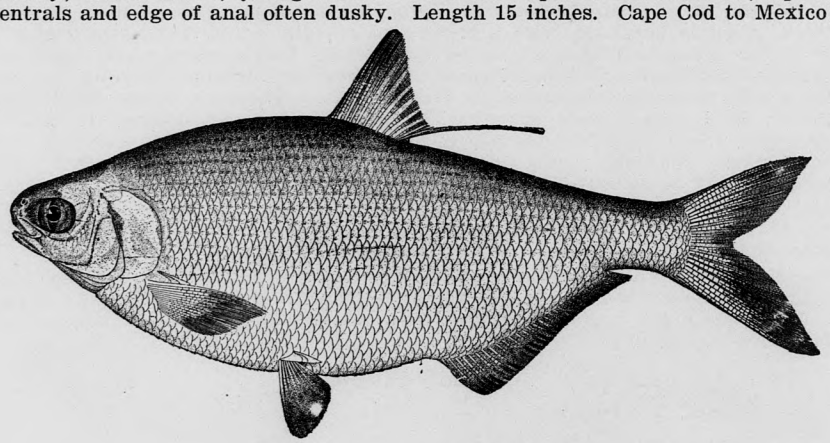


Fig. 14.—Dorosoma cepedianum

abundant southward, entering all rivers and permanently resident everywhere in the Mississippi Valley in the larger streams; also introduced into Lake Michigan and Lake Erie, and landlocked in ponds from New Jersey to Texas. A handsome fish, of no value as food.

Maryland localities: Anne Arundel, Baltimore, Cecil, Worcester, Calvert, Harford, St. Mary's and Montgomery counties.

ROUND HERRING — Family **Clupeidæ**

Etrumeus teres, (De Kay)

Alosa teres, (De Kay), New York Fauna, Fishes, 262, 1842, N. Y.

Head 4; depth 6. D. 18; A. 13. Body terete and fusiform. Mouth small, maxillary reaching front of orbit. Vomerine teeth present. Eye large, equal to snout. Fins all very small, the ventrals entirely behind dorsal. Auxiliary scales very long. Olivaceous above, silvery on sides and below, no distinct lateral band. Length 10 inches. Cape Cod to the Gulf of Mexico, on sandy shores, not rare southward.

Maryland localities: Worcester county.

COMMON HERRING

Clupea harengus, (Linn.)

Clupea harengus, Linn. Syst. Nat., ed. X, 317, 1758, seas of Europe.

Head 4½; depth 4½; eye 4; D. 18; A. 17; lateral line 57; ventral scutes 28 plus 10; vertebræ 56. Body elongate, compressed. Scales loose. Cheeks longer than high. Vomer with an ovate patch of small permanent teeth; palatine teeth minute, if present; tongue with small teeth; jaws with or without minute teeth. Gill rakers very long, fine and slender, about 40 on the lower part of the arch. Eye longer than snout. Dorsal inserted rather behind middle of body in front of ventrals. Pectorals and ventrals short; anal low. Abdomen serrated in front of ventrals as well as behind, the serratures weak. Bluish, silvery below with bright reflections. Length 16 inches. North Atlantic Ocean; abundant on the coasts both of Europe and America, chiefly north of Cape Hatteras where it is known as Labrador herring; the young are canned as sardines at Eastport, Maine, and elsewhere. Spawns in the sea.

Maryland localities: Worcester county.

HICKORY SHAD; TAILOR HERRING; FALL HERRING; MATTOWACCA

Pomolobus mediocris, (Mitchill)

Clupea mediocris, Mitchill, Trans. Lit. Phil. Soc., N. Y., I, 1815, 450, New York.

Head 4; depth 3⅜. D. 15; A. 21; lateral line 50; ventral scutes 20 plus 16. Head comparatively long, the profile straight and not very steep, form more elleptical than in the others, and less heavy forward. Lower jaw considerably projecting; upper jaw emarginate. Opercles rather less emarginate below and behind than in *P. pseudoharengus*. Fins low, dorsal fin inserted nearer snout than base of caudal. Bluish silvery, sides with rather faint longitudinal stripes. Peritoneum pale. Length 24 inches. Cape Cod to Florida; rather common; not highly valued as a food fish, not ascending streams to spawn.

Maryland localities: Baltimore, Cecil, Charles, Harford, Calvert, Somerset and St. Mray's counties.

BRANCH HERRING; ALEWIFE

Pomolobus pseudoharengus, (Wilson)

Clupea pseudoharengus, Wilson, Ree's Encycl., IX, about 1811, probably Delaware River near Philadelphia.

Head 4⅔; depth 3⅓; eye 3½. D. 16; A. 19; lateral line 50; scutes 21 plus 14. Body rather deep and compressed, heavy forward. Head short, nearly as

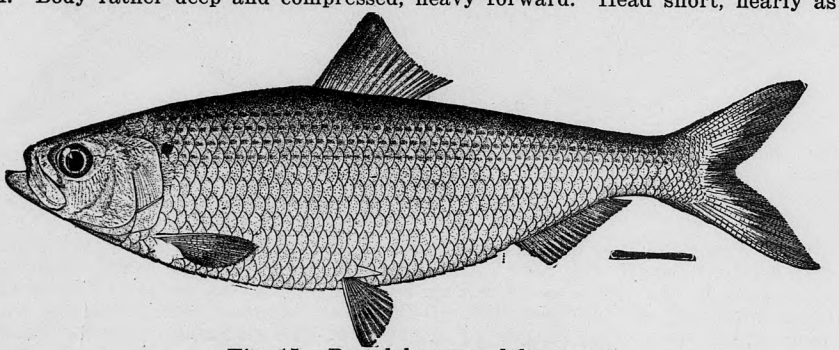


Fig. 15.—Pomolobus pseudoharengus

deep as long, the profile somewhat steep and slightly depressed above the nostrils. Maxillary extending to posterior margin of pupil. Lower jaw somewhat projecting; upper jaw emarginate. Eye large, slightly longer than snout. Gill rakers long, to 40 below the angle of the arch, shorter and stouter than in *A. sapidissima.* Lower lobe of caudal the longer. Bluish above, sides silvery; indistinct dark stripes along the rows of scales; a blackish spot behind opercle. Atlantic coast of the United States, abundant, entering streams to spawn; also landlocked in the lakes of western New York, and in Lake Ontario where it is excessively abundant and where great multitudes sometimes die in early summer.

Maryland localities: Anne Arundel, Baltimore, Caroline, Cecil, Worcester, Calvert, Dorchester, Queen Anne, Somerset, Harford, Kent and Prince George counties.

GLUT HERRING; BLUEBACK; BLACKBACK; SUMMER HERRING; KYACK; SAWBELLY

Pomolobus æstivalis, (Mitchill)

Clupea æstivalis, Mitchill, Trans. Lit. Phil. Soc., N. Y., I, 1815, 456, New York.

Head 5; depth 3½. Similar to the preceding, from which it is best distinguished by the black peritoneum. Body more elongate, the fins lower and the eyes smaller, the back darker. First ray of dorsal not equal to base of fin. Atlantic coast, appearing later than the preceding; less abundant northward, and less valuable as a food-fish, perhaps ranging farther southward. In the Southern States more abundant than the preceding, from which few fishermen distinguish it with certainty.

Maryland localities: Cecil, Charles, Calvert, Harford and St. Mary's counties.

COMMON SHAD; AMERICAN SHAD; NORTH RIVER SHAD; POTOMAC SHAD

Alosa sapidissima, (Wilson)

Clupea sapidissima, Wilson, in Ree's New Cyclopedia, IX, no pagination or date, but prior to 1812; no locality, but probably Philadelphia.

Head 4¼; depth 3. D. 15; A. 21; lateral line 60. Body comparatively deep. Mouth rather large, the jaws about equal, the lower fitting into a notch in the tip of the upper, no teeth. Preorbital moderate; cheeks much deeper than long, the preopercle extending little forward, joining the mandible at a point rather behind the eye. Gill rakers extremely long and slender, much longer than eye, about 60 below the angle of the arch, the number smaller in specimens from the Gulf of Mexico, which perhaps represent a tangible variety. Fins small; dorsal much nearer snout than base of caudal. Peritoneum white. Bluish above, sides white and silvery, a dark spot behind opercle and sometimes

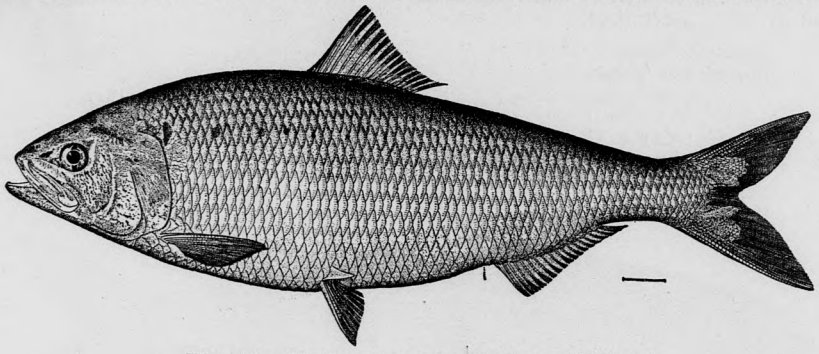


Fig. 16.—Shad—Alosa sapidissima (Wilson)

several along the line dividing the color of the back from that of the sides; axil dusky. Length 2½ feet. Atlantic coast of the United States from the Mirimachi to the Alabama ascending rivers in spring to spawn. One of the most important of our food fish, of the most excellent flavor, though with many small bones. Also introduced by the U. S. Fish Commission on the Pacific coast, where it is now abundant from Monterey northward. Specimens from

the Gulf of Mexico are smaller, and have shorter and fewer gill rakers, constituting a slight variety. Most delicious.

Maryland localities: Anne Arundel, Calvert, Baltimore, Caroline, Cecil, Dorchester (Choptank River, Hunting Creek, Nanticoke River and Marshyhope Creek), Harford, Kent, (Millington) Montgomery, Prince George, Somerset, St. Mary's, Talbot (St. Michael River), Wicomico (Salisbury) and Worcester (Snow Hill) counties.

THREAD HERRING; MACHUELO; CALLEU-TASSART; SPRAT

Opisthonema oglinum, (Le Sueur)

Megalops oglina, Le Sueur, Jour. Ac. Nat. Sci., Philadelphia, I, 1817, 359; Newport, R. I.

Head 4⅓; depth 3½. D. 19; A. 24; lateral line 50; scutes 17 plus 14. Body oblong, compressed, formed as in Harengula, the belly strongly serrate. Tongue with minute teeth, jaws toothless, lower jaw slightly projecting; maxillary reaching nearly to middle of orbit. Gill rakers very long and slender. Bluish above, silvery below, an indistinct bluish shoulder spot, each scale on the back with a dark spot. Length 12 inches. West Indian fauna, regularly northward to Florida and Carolina, occasionally straying much farther (Longport, New Jersey, Bean; and Fortress Monroe, Kendall). Abundant in the tropics.

Maryland localities: Worcester county. Uhler and Lugger record it from tributaries to Chesapeake Bay.

MENHADEN; MOSSBUNKER; ALEWIFE; BONY-FISH; WHITE-FISH; BUG-FISH; FATBACK; YELLOW-TAIL; POGY

Brevoortia tyrannus, (Latrobe)

Clupea tyrannus, Latrobe, Trans. Amer. Phil. Soc., Phila., V, 1802, 77, pl. 1, Chesapeake Bay.

Head 3 1/5; depth 3. D. 19; A. 20. Lateral line 60 to 80. Ventral plates 20 plus 12. Head rather short and heavy. Fins comparatively short, the height of the dorsal less than the length of the maxillary; height of anal less than half the length of the maxillary; pectorals not reaching to ventrals; dorsal inserted slightly behind ventrals, about midway between snout and base of caudal. Scales moderate, strongly serrated, arranged very irregularly, those before

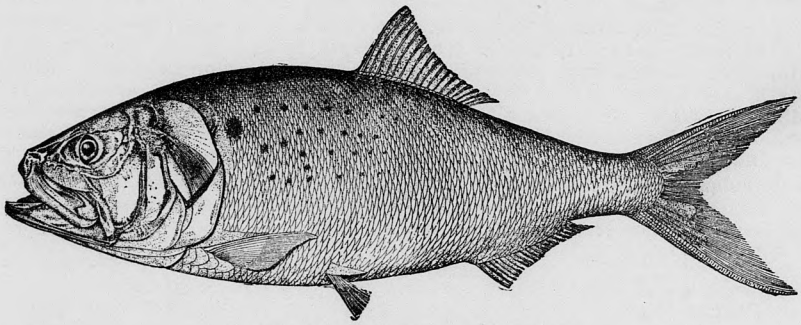


Fig. 17.—Brevoortia tyrannus

dorsal strongly pectinate. Operculum strongly striated or almost smooth. Gill rakers much longer than eye. Bluish above, sides silvery, with a strong brassy luster. Fins usually yellowish; a conspicuous dark scapular bloth behind which are often smaller spots. Length 18 inches. Nova Scotia to Brazil; very abundant southward, herbivorous, running in schools, probably spawning in brackish water. Held in no esteem as a food fish, but very valuable for oil and fertilizer.

Maryland localities: Anne Arundel, Baltimore, Cecil, Charles, Kent, Somerset, St. Mary's and Worcester counties.

Family **Engraulididæ**

THE ANCHOVY

Anchovia mitchilli, (Valenciennes)

Engraulis mitchilli, Valenciennes, Hist. Nat. Poiss., XXI, 50, 1848, New York, Carolina, New Orleans.

Body compressed, short and deep, its greatest depth one-fourth of the total length without caudal; caudal peduncle short and deep, its least depth one-half the length of head. Thickness of body equals three-sevenths of length of head. Head rather short, its length two-ninths of total without caudal. Snout shorter than eye, which is two-sevenths as long as the head. The maxilla extends slightly beyond the hind end of mandible, and nearly to the edge of operculum. Interorbital distance not quite equal to eye. Gill rakers nearly as long as the eye. Origin of dorsal fin much nearer to base of caudal than to tip of snout. Length of dorsal base equals two-thirds of length of head; longest dorsal ray one-half as long as head. Anal origin under the middle of dorsal; length of anal base equals two-sevenths of total length without caudal; longest anal ray about two-thirds as long as the head. Ventral short, in advance of dorsal, its length one-third of length of head. Pectoral one-eighth of total length without caudal. Width of silvery band about two-thirds of eye. Dorsal and anal scaly sheaths very strong. D. ii, 10; A. 28; V. i, 6. Scales 37. Length of specimens examined, 4 inches. Taken at Fire Island. Cape Cod to Texas, on sandy shores.

Maryland localities: Anne Arundel, Baltimore, Cecil, Charles, Kent, Somerset, St. Mary's and Worcester counties.

BROAD BANDED ANCHOVY

Anchovia epsetus, (Bonnaterre)

Esox epsetus, Bonnaterre, Ichthyol., 175, 1788, Jamaica.

Differs from *A. mitchilli* in the broad, sharply defined silvery lateral band nearly wide as eye. Reaches 6 inches.

Maryland localities: Anne Arundel and Somerset counties.

Family **Anguillidæ**

THE TRUE EEL

Anguilla rostrata, (Le Sueur)

Muræna rostrata, Le Sueur, Jour. Ac. Nat. Sci., Phila., 1821, 81, Cayuga Lake.

Distance from front of dorsal to vent 1 1/6 to 2 in head; pectoral 2 5/6 to 3 2/5 in head; head 2 to 2½ in trunk. Form rather robust. Brown, nearly plain, often tingued with yellowish; paler below, the color extremely variable. Length 4 or 5 feet. Atlantic coast of the United States; very abundant from Maine to Mexico; ascending all rivers south of Canada and east of the Rocky Mountains and resident throughout the Mississippi Valley. Common in the West Indies. Not found in the Pacific. A food fish of importance.

Maryland localities: Anne Arundel, Baltimore, Calvert, Cecil, Charles, Harford, Kent, Montgomery, Somerset, St. Mary's and Worcester counties. Abundant in all streams tributary to Chesapeake Bay.

Family **Congridæ**

CONGER EEL

Conger conger, (Linn.)

Muræna conger, Linnæus, Syst. Nat., X, 245, 1758 (based on Artedi).

Dorsal beginning opposite to or just behind tip of pectoral; eye 1½ in snout, 5 to 6 in head; snout 3¼ to 4½ in head; gape extending nearly or quite to posterior margin of eye; head 1 4/5 to 1 6/7 in trunk; tail longer than rest of body; pectoral 3½ in head; upper lip full, with conspicuous pores. Ashy gray or blackish; vertical fins with a black margin; body sometimes entirely black. Atlantic Ocean, generally common on both coasts, from Cape Cod to Brazil; also on coasts of Asia and Africa; almost cosmopolitan, but not found in the eastern Pacific. It reaches a length of eight feet and is a food fish of importance, especially in Europe.

Maryland localities: Worcester county and lower Chesapeake.

Family **Salmonidæ**

BROOK TROUT; SPECKLED TROUT

Salvelinus fontinalis, (Mitchill)

Salmo fontinalis, Mitchill, Trans. Lit. and Phil. Soc., N. Y., I, 1815, 435, near New York City.

Head 4½; depth 4½. D. 10; A. 9; scales 37-230-30. Gill rakers about 6 plus 11. Body oblong, moderately compressed, not much elevated. Head large, not very long, the snout bluntish, the interorbital space rather broad. Mouth large, the maxillary reaching more or less beyond the eye. Eye large, usually somewhat above the line of the axis of the body. Caudal fin slightly lunate in the adult, forked in the young; adipose fin small; pectoral and ventral fins not especially elongate. Red spots on the sides rather smaller than the pupil; back mostly without spots, more or less barred or mottled with dark olive or black; dorsal and caudal fins mottled or barred with darker; lower fins dusky, with a pale, unusually orange band anteriorly, followed by a darker one; belly in the

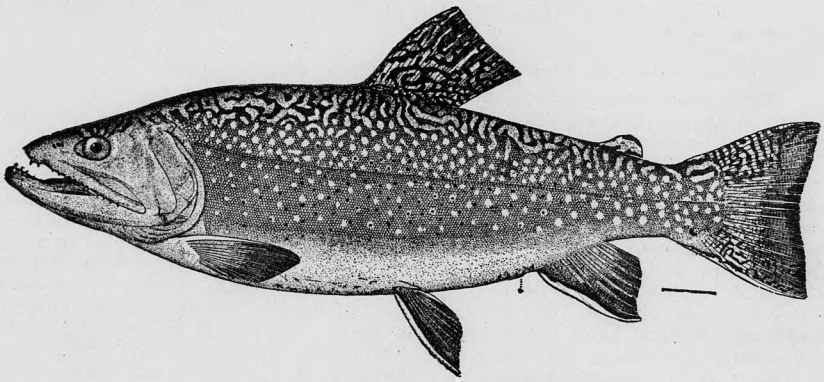


Fig. 18.—Salvelinus fontinalis

males more or less red. Many local varieties, distinguished by shades of color, also occur. Length 18 inches or less. The best known of our charrs abounding in all clear cold streams from Maine to the Saskatchewan and northward to Labrador, southward in the Alleghenies to the head waters of the Savannah, Chattahoochee, Catawba, and French Broad, largely introduced into western streams but not native west of the Mississippi.

Maryland localities: Baltimore, (Blackwater), Allegany, Garrett and Washington counties.

Family **Synodontidæ**

LIZARD FISH

Synodus fœtens, (Linn.)

Salmo fœtens, Linnæus, Syst. Nat., ed. XII, 513, 1766, South Carolina.

Head 4½; depth 7; eye 5½. D. 9 or 10; A. 11 or 12; V. 8; scales 7-60 to 64-8 (the vertical rows counted obliquely). Snout long, the upper jaw 1½ in head. Scales less regularly arranged and the rows less oblique than in *Synodus lucioceps*. Pectoral fins short, 2 in head, not reaching ventrals, length ¾ that of the premaxillary; ventral large 1¼ in head. Interorbital space considerably concave, with radiating ridges. Olivaceous or sandy gray, yellowish below; back mottled; upper surface of head brownish, distinctly vermiculated with yellowish; ventral fins, lower side of head and inside of mouth tinged with yellow; no scapular spot, snout not black at tip, dorsal scarcely barred. Length 12 inches. Cape Cod to Brazil, very common from South Carolina southward on sandy coasts, not valued as food.

Maryland localities: St. Mary's and Worcester counties. Uhler and Lugger record it from the Potomac tidal and both shores of the Chesapeake.

Family **Esocidæ**

PIKE OR PICKEREL

Esox americanus, (Gmelin)

Esox lucius americanus, Gmelin, Systema Nat., 1390, 1788, Long Island, New York, after Schöpf.

Head 3⅗; depth 5½; eye 5. B. 12 or 13; D. 11 or 12; scales 105. Body short and robust; head heavy, with blunt, short snout; eye rather large, its diameter 2⅔ in length of snout, its posterior margin scarcely behind middle of head, its middle nearer tip of chin than gill opening; snout 2½ in head. Cheeks and opercles fully scaled; upper branchiostegals scaly. Dark green; sides with about twenty distinct blackish, curved bars, sometimes obscurely marked, but not distinctly reticulated; a black bar below eye, another from upper edge of opercle through eye to snout; fins plain. Length 12 inches. A small pickerel, abundant from Massachusetts to Florida, in lowland streams and swamps. Found only east of the Allegheny Mountains, the westernmost record being from Escambia River, at Flomaton, Alabama.

Maryland localities: Anne Arundel, Cecil, Harford, Kent, (Fairlee Creek) and Worcester counties.

COMMON EASTERN PICKEREL; GREEN PIKE; JACK

Esox reticulatus, (Le Sueur)

Esox reticulatus, Le Sueur, Journ. Ac. Nat. Sci. Phila., I, 1818, 414, Connecticut River, Adams, Mass., Philadelphia.

Head 3½; depth 6; eye small, about 3½ in snout, 8 in head. B. 14 to 16; D. 14; A. 13 (counting developed rays only); scales 125. Body rather slender, deepest near the middle and tapering backward to a slender caudal peduncle; head long, the snout prolonged, about 2⅛ times in head. Middle of eye midway between tip of chin and gill opening. Cheeks and opercles entirely scaly; caudal well forked. Color green, of varying shades; sides with golden luster and marked with numerous dark lines and streaks, which are mostly horizontal, and by their junction with one another produce a reticulated appearance; a dark band below eye; fins plain. Length 24 inches. Maine to Florida and Louisiana, Arkansas and Tennessee; common everywhere east and south of the Allegheny Moutains; abundant in the New York lakes. The southernmost record is from Crooked Lake, Orange County, Florida. The westernmost is from Mammoth Springs, Ark., and other tributaries of White River, it being common in the Ozark region.

Maryland localities: Anne Arundel, Baltimore, Caroline, Cecil, Calvert, Charles, Harford, Kent, Montgomery, Talbot, Wicomico, and Worcester counties.

Family **Umbridæ**

EASTERN MUD-MINNOW

Umbra pygmæa, (De Kay)

Leuciscus pygmæus, De Kay, New York Fauna, Fishes, 214, 1842, Tappan, Rockland Co., N. Y.

Head 4; depth 4½. D. 13; A. 7; scales 35. Body less compressed than in *Umbra limi*, the head broader, less depressed, with smaller eye; interorbital space slightly more convex; snout shorter, the profile more gibbous. Color dark greenish, with about 12 narrow longitudinal pale stripes, the one beginning at upper angle of opercle double the width of any of the others; dark bar at base of caudal very distinct, covering 1½ scales; lower jaw mostly black. Length 4 inches. Lowland streams and swamps coastwise, from Long Island to the Neuse River; locally abundant.

Maryland localities: Baltimore, Cecil, Prince Georges, Charles, Worcester, Calvert, Washington, and Wicomico counties.

Family **Pœciliidæ**

KILLIFISH; MAYFISH; ROCKFISH

Fundulus majalis, (Walbaum)

Cobitis majalis, Walbaum, Artedi, Pisc., III, 12, 1792, Long Island.

Head 3¾; depth 4; D. 12; A. 10; scales 36-13. Body oblong, scarcely elevated, little compressed; head rather prolonged anteriorly; the mouth small, terminal, and very oblique; scales rather large; dorsal fin moderate; anal fin

very high in the males, moderate in the females; ventrals long in the males, reaching past front of anal; eye moderate, shorter than snout and than interorbital space; a slight angle formed by the profile, in front of the eye, due to the greater flattening of the snout. Males dark olivaceous above; sides silvery or somewhat golden, with about a dozen broad transverse bars of the color of the back; posterior part of the dorsal fin with a black patch; fins yellowish or pale. Females olivaceous above, white below, a narrow black longitudinal stripe along side about on the level of the eye and as wide as the pupil; below this, two similar black stripes anteriorly and one posteriorly, the upper one being interrupted; one or two black bars at base of caudal. Females

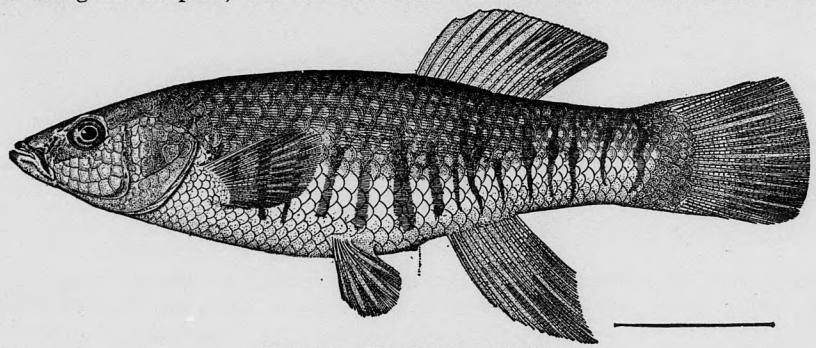


Fig. 19.—Fundulus majalis ♂

usually larger than the males. A large male of this species in high coloration, taken at Beaufort, N. C., showed the following colors in life: back olive, sides and belly bright salmon yellow, lower fins clear yellow, pectorals and anal with some dusky; posterior edge of caudal dark; dorsal nearly all black, a large black ocellated spot on the last rays; opercles and underparts of head with an inky suffusion; cheeks, top of head, and mouth bronze yellow; sides with about

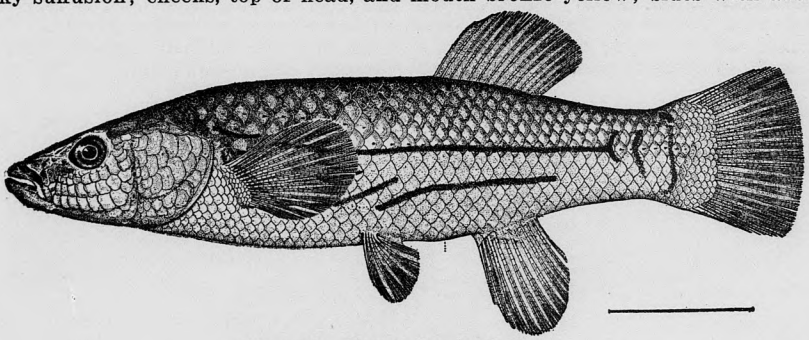


Fig. 20.—Fundulus majalis ♀

eighteen narrow, dusky vertical bars. Teeth in a broad band; an outer row of rather large teeth. Oviduct adnate to first anal ray for a short distance. Length six inches. Cape Cod to Florida; the largest of our *Pœciliidæ*; abundant in shallow bays, especially northward.

Maryland localities: Anne Arundel, Baltimore, Charles, Kent, St. Mary's and Worcester counties.

COMMON KILLFISH; MUMMICHOG; MUD-FISH

Fundulus heteroclitus, (Linn.)

Cobitis heteroclita, Linn., Syst. Nat., ed. XII, 11, 500, 1266, Charleston, S. C.

Body short, deep; the head short, broad; eye about equal to snout. Male dark green, sometimes orange below; sides with scattered yellowish spots, sometimes running into silvery cross-bars; vertical fins dark, with pale spots,

usually a black spot on D. Young with 9 to 10 silvery bars; young ♂ with 9 or 10 black bars; adult ♀ nearly plain. Head 3⅔; depth 3½. D. 11; A. 10.

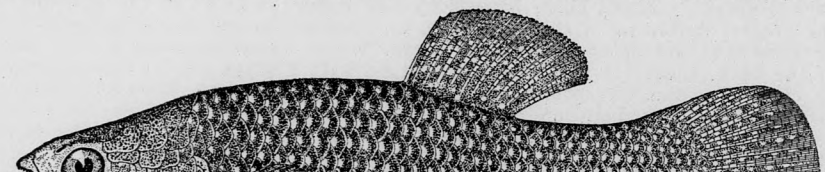


Fig. 21.—Fundulus heteroclitus

Scales 35-12. L. 2 to 5. Maine to Mexico; everywhere common along shore, in shallow water; southern specimens (var. *grandis* Baird and Girard) larger and brighter.

BARRED KILLIFISH. (PIKE-MINNOW)

Fundulus diaphanus, (Le Sueur)

Hydrargyra diaphana, Le Sueur, Journ. Ac. Nat. Sci., Phila., I, 1817, 130, Saratoga Lake.

Head 4; depth 4 4/5; eye large, 3½ in head. D. 13; A. 11; scales 45-15. Body rather slender, not elevated, compressed posteriorly. Head moderate; quite flat above. Teeth pointed, the outer not much enlarged. Fins not large; dorsal and anal rather low; ventrals scarcely reaching vent in the females; somewhat longer in the males. General color olivaceous; sides silvery. Male with about 20 silvery vertical bars, narrower than the dark interspaces; female with 15 to 20 dark transverse bars, shorter than the silvery bands of the male,

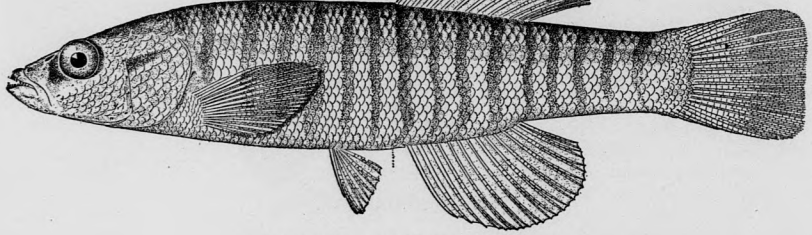


Fig. 22.—Fundulus diaphanus

the interspaces pale; back sometimes spotted; young always with black bars; fins nearly plain. Length 4 inches. Coast of Maine (W. C. Kendall) to Cape Hatteras, in river mouths, ascending streams to their fountain heads, hence abundant in lakes throughout New York; variety *menona* westward to northern Illinois; not found southward. The typical form found eastward and in the sea has the back nearly or quite unspotted. Examples from Grand Lake Stream and Boyden Lake, Maine, have the back somewhat spotted. In the Potomac River this is the most abundant species of the family.

Maryland localities: Anne Arundel, Baltimore, Caroline, Cecil, Charles, Harford, Kent, Montgomery, Somerset, Prince Georges, St. Mary's and Worcester counties.

BROWN KILLIFISH

Fundulus luciæ, (Baird)

Hydrargyra luciæ, Baird, Ninth Smithsonian Rep., 1854 (1855), 344, Beesley's Point, New Jersey.

Head 3½; depth 4¼ to 4½; eye 3. D. 8; A. 10; scales 34 or 35-10. Dorsal fin inserted behind front of anal and lower than the latter; when flexed, its extremity is opposite tip of anal; ventral fins small, about equal to head behind eye, or half the length of pectorals, their extremity reaching anus. Vertical bars 10 to 12 in number, sharply defined, their width being equal to the interspaces and slightly increasing toward the tail; these bars begin and end abruptly, not reaching the median line above or below by about half the width of the eye; opercles, cheeks and chin thickly covered with dark spots, largest on the cheeks and opercles, and least numerous on the cheeks; upper parts in life of a dark green color, which fades into reddish yellow on sides and abdomen; inferior fins pale yellowish; the vertical bars rich black, with a bluish reflection; dorsal with a pale tip and a dark base anteriorly; on dorsal behind a jet-black rounded ocellate spot about ⅔ width of eye and involving rather more than half width of fin, margined anteriorly and inferiorly by a pure white spot. Atlantic Coast from Long Island to Virginia; rare; a pretty little fish only lately rediscovered by Dr. Hugh M. Smith, from whose account the above description is compiled.

Maryland localities: Anne Arundel, Calvert, Kent, Somerset, St. Mary's and Worcester counties.

RAINWATER FISH

Lucania parva, (Baird)

Cyprinodon parvus, Baird, Ninth Smithsonian Rep., 1855, 345, Long Island.

Head 3¼; depth 3¼; eye 3. D. 10 to 12; A. 10 or 11; scales 26-8. Body deep. Females larger than males; both sexes plump. Color in life: Males olive with bluish reflections; edges of the scales darker; dorsal dusky orange with a large black spot at the base in front, ocellated with orange; caudal orange yellow, tipped with black; ventrals and anal orange red, tipped with dusky; pectorals translucent. Females with the fins pale olive, without black spot or edgings. Length 1½ to 2 inches. Atlantic Coast from Connecticut to Key West; very common at Key West in shallow waters and tide pools close to the shore, especially where fresh waters meet the sea; equally abundant at the mouth of the Potomac in brackish ponds and tide ditches.

Maryland localities: Anne Arundel, Kent, St. Mary's and Worcester counties.

SHEEPSHEAD MINNOW; PURSY MINNOW

Cyprinodon variegatus, Lacépède

Cyprinodon variegatus, Lacépède, Hist. Nat. Poiss., V, 486, 1803, South Carolina.

Head rather small, 3¼ to 3⅗. Depth 2 to 2⅔. Eye 1½; interorbital width 3 in head. D. 11; A. 10; B. 6; scales 26-13. Body very short and robust,

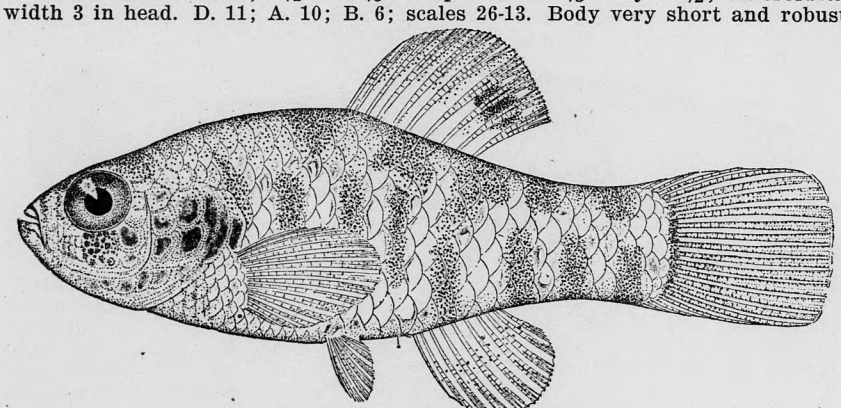


Fig. 23.—Cyprinodon variegatus

in adults high and much compressed, the females abruptly constricted at base of caudal peduncle; caudal peduncle rather short and high. Head short, little depressed with sharp snout and small mouth. Dorsal moderate in females, as high as the length of its base, much higher in males. Color: Male olivaceous, from dorsal forward above pectoral to head deep lustrous steel blue, the color very intense and conspicuous in life; rest of upper parts with rather greenish luster, becoming dull slaty blue, and on cheeks, opercles, sides anteriorly and belly deep salmon color. Smaller specimens show some orange shading on the sides. Females very light olive, lower half of sides with wide and narrow vertical dark bars; usually seven or eight dark crossbars on the back alternating with the wide bars below. Length: Male three inches; female two inches. Cape Cod to the Rio Grande, in brackish waters, very abundant southward, the males more highly colored southward, but the southern form called *gibbosus* not otherwise different.

Maryland localities: Anne Arundel, Kent, St. Mary's and Worcester counties.

TOP MINNOW

Gambusia affinis, (Baird and Girard)

Heterandria affinis, Baird & Girard, Proc. Ac. Nat. Sci. Phila., 1853, 390, Rio Medina and Rio Salado, Texas.

Head 3¼ to 4; depth 3⅔ to 4. D. 7 to 9; A. 8 to 10. Scales 29 to 32, usually 30-8 to 10. Body rather plump, large specimens becoming deep. Head moderate, very broad and much depressed; teeth in broad villiform bands; eye moderate, 1½ to 1¾ in interorbital width, 3 to 3½ in head. Intestinal

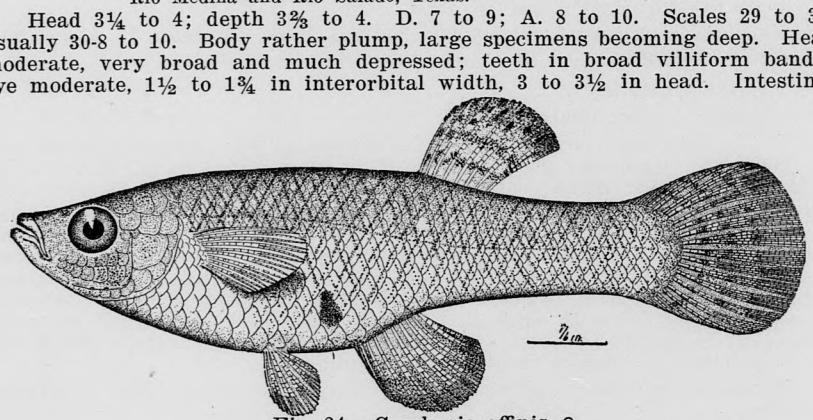


Fig. 24.—Gambusia affinis ♀

canal as long as body. Dorsal small, far back; distance from its insertion to caudal half that to snout, its first ray about over middle of anal; anal larger and higher than dorsal. Light olive, each scale edged with darker; a very

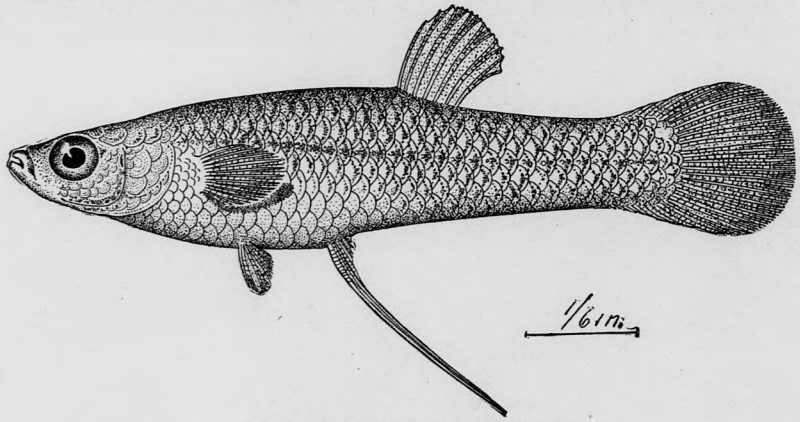


Fig. 25.—Gambusia affinis ♂

narrow dark streak along sides; top of head dusky; a more or less distinct triangular bluish-black bar below eye; sides and belly anteriorly dusky with dark dots; a black blotch on each side of belly, caused by the black internal organs showing through the skin; young specimens often uniform yellowish; fins dusky; the caudal usually with cross series of dots. Length 1½ to 2 inches. Males very scarce and very small about ½ to 2 inches long, the anal process as long as head. Marshes and lagoons of the South Atlantic and Gulf Coasts, Delaware to Mexico and north to southern Illinois, in brackish or fresh water; excessively common southward, usually in clear water, but in sluggish rather than running streams. The young are produced in summer.

Maryland localities: Chesapeake Bay and Worcester county.

Family **Syngnathidæ**

Common Pipefish

Syngnathus fuscus, (Storer)

Syngnathus fuscus, Storer, Report Fish Mass., 162, 1839, Nahant.

Head 7½ to 9 in total length. D. 36 to 40; rings 18 to 20, 36 to 40. Snout short, about 2 in head; median line above and below well keeled, the ridge on each side of median ridges rather conspicuous. Occiput, nuchal plates, and opercle carinate; belly somewhat convex, scarcely keeled. Dorsal longer than head, covering 4-5+5-4 rings, its height 5-6 in length of its base; tail much longer than trunk. Color brownish in spirits; lighter below. Atlantic Coast of the United States, Cape Ann to Virginia; very common northward, where it is the only species of pipefish.

Maryland localities: Anne Arundel, Charles, Somerset, Dorchester, Calvert, St. Mary's and Worcester counties. Common in Tangier Sound.

Florida Pipefish

Syngnathus floridæ, (Jordan and Gilbert)

Siphostoma floridae, Jordan and Gilbert, Proc. U. S. Nat. Mus., 239, 1884, Key West, Florida.

Head 6 to 6½ in total length. D. 27. Rings 17 or 18 plus 31 or 32. Dark green. Sides with gray specks, without gray band. Tail with faint dark bars, wider than interspaces. Reaches over 7 inches. Chesapeake Bay to Florida.

Maryland localities: Somerset county.

Louisiana Pipefish

Syngnathus louisianæ, (Günther)

Syngnathus louisianæ, Günther, Cat. Fish. Brit. Mus., VIII, 160, 1870, New Orleans.

Head 7 to 7⅗ in total length. D. 32, to 37. Rings 20 to 21+36 to 38. Trunk broader below. Snout moderate, about 1⅗ in head; median ridge above and below, a ridge on each side of the median ridge above and below. Occiput, nuchal plates and opercle somewhat keeled. Belly flat or slightly concave, with a median ridge. Dorsal fin well developed, shorter than head, covering 3 plus 5 rings. Caudal longer than pectoral, 2½ in base of dorsal. Tail longer than trunk, 1 7/9 in total length. Color brownish, lightish on lower part of trunk and below; sides with a distinct band of brown, brown of the side extending through eye to middle of snout. Atlantic and Gulf coasts of the United States, North Carolina to Texas, south to Key West; common and variable.

Maryland localities: St. Mary's county.

Sea Horse

Hippocampus hudsonius, (De Kay)

Hippocampus hudsonius, De Kay, N. Y. Fauna, Fishes, 322, pl. 53, fig. 171, 1842.

Body heptagonal, composed of twelve segments, armed each side with three rows of prominent spines, formed by the junction of the plates, and a single row beneath. On the summit of the head is a large bony protuberance, terminating in five distinct points. Length of the head is more than one-fifth the entire length, and the prehensile tail is longer than the body, quadrangular, and divided into 32 segments. Color light brown, with iridescent opercles. Length 3 to 6 inches. D. 18; P. 15; A. 3.

Maryland localities: Worcester county and lower Chesapeake in Maryland.

Family **Exocœtidæ**

FLYING FISH

Cypselurus heterurus (Rafinesque)

Exocœtus heterurus, Rafinesque, Caratteri di Alcuni Nuovi Generi, 58, 1810, Palermo.

Head 4⅔; depth 5⅓; scales 58, 26 before ventrals, 33 before dorsal, 7 rows of scales between dorsal and lateral line. D. 14; A. 9. Anal fin short, its base ½ to ⅔ length of base of dorsal; its insertion behind first ray of dorsal; its rays 9 or 10; second ray of pectoral divided (first simple); third and fourth rays longest; ventral fins inserted about midway between pupil and last caudal vertebra; base of anal 1⅔ in base of dorsal; pectoral 1 4/9 in length, reaching last ray of dorsal; ventrals 2¾ in body, reaching last ray of anal; snout 3¾ in head; eye 3 1/5; lower lobe of caudal about ¼ longer than head. Pectoral fins with an oblique white band across lower half of fin; dorsal and anal plain; ventrals white, their axil scarcely dusky. Length 15 inches. Atlantic Ocean, generally common southward on both coasts, straying northward to banks of Newfoundland and to England. The young are often provided with a long barbel at the chin.

Maryland localities: Worcester county. Reported by Uhler and Lugger from the Potomac mouth and southern Chesapeake Bay.

Family **Hemiramphidæ**

ESCRIBANO; HALF BEAK

Hyporhamphus unifasciatus, (Ranzani)

Hemirhamphus unifasciatus, Ranzani, Nov. Comm. Ac. Sci. Bonon., V, 1842, 326, Brazil.

Head 4 5/6; depth about 6½. D. 12 to 14; A. 15; scales 52; vertebræ 32 plus 18=52. Lower jaw from end of upper jaw 6 to 7 in total length from its tip to base of caudal. Its length in adult always less than that of rest of head; young with the beak proportionately longer; head with lower jaw 3 in body; body half deeper than broad; premaxillary plate broader than long; eye less than interorbital width, ⅗ postorbital part of head; ventrals midway between eye and base of caudal; dorsal and anal densely scaly; back broad. Length one foot. West Indian fauna, generally common from Key West to Rio de Janeiro; also taken at Panama; this or some very similar species also in the East Indies and on the coast of Africa. The young of this species has the beak longer and cannot always be readily distinguished from *Hyporhamphus roberti*, which is, however, always more slender.

Maryland localities: Bay side of St. Mary's county as *Hemiramphus roberti* (non Valenciennes), Uhler and Lugger.

BALAO; ESCRIBANO

Hemiramphus brasiliensis, (Linn)

Esox brasiliensis, Linnæus, Syst. Nat., ed. X, 314, 1758, Jamaica; after Brown, the Timucu of Margrave wrongly included in the synonymy; Bloch, Ichth., 391, 1801, corrected synonymy and description.

Head (with lower jaw) 2¾; depth 6⅔. D. 14; A. 12; scales 53. Body not very slender, compressed "slab sided," the sides of body vertical not parallel with each other. Lower jaw (from end of upper jaw) 4 2/5 in length from its tip to base of caudal. Head without mandible, five in length from tip of upper jaw. Premaxillaries broader than long. Eye large, equal to interorbital space, ⅔ postorbital part of head. Color in life clear deep blue green. Sides silvery without lateral band, beak dark, tip bright orange, its membrane edged with white. Lobe of dorsal and upper lobe of caudal deep orange yellow; ventrals tipped with yellow; sexes alike. Length fifteen inches. West Indies, generally abundant from Key West southward to Bahia; this or some closely related species also occuring at Panama. Common at Key West and Havana; a specimen taken at Hunger's Wharf, Virginia, by Dr. J. T. Wilkins; a good food fish, well distinguished by its orange caudal fin.

Maryland localities: A specimen in the Academy of Natural Sciences, Philadelphia, obtained in the Baltimore market, alleged to have been captured in Chesapeake Bay, Md.

Family **Gasterosteidæ**

FOUR-SPINED STICKLEBACK

Apeltes quadracus, (Mitchill)

Gasterosteus quadracus, Mitchill, Trans. Lit. and Phil. Soc., I, 1815, 430, New York.

Head 4; depth D. III-I, 11; A. I, 8. Trunk oblong; head pointed; caudal peduncle very long and slender not keeled about, about 5 in length. Mouth small, horizontal. Maxillary not reaching to eye; teeth slender, in a single series. No bony dermal plates along sides. Scapula forming a small granulated postopercular plate. Innominate bones wide apart; the area between them flat, so that a section of the fish is triangular. Gill membrane broadly united to the isthmus. Free dorsal spines divergent; the spines slender, pointed, slightly serrate; distance between first and third spine much less than that between third and fourth; the first extending beyond base of third; caudal long, narrow; anal similar to soft dorsal and coterminous with it, its spine under third ray of dorsal; ventral spines strong, subterete, serrate on both edges and covered by skin to near tip; when the ventral spines are set they point almost sidewise, when depressed they lie along inside of innominate bones. Brownish olive above, mottled with darker; silvery below; male almost black; ventrals with the membrane red in spring. Length 1½ to 2½ inches. Maine to Virginia, in salt water; very abundant northward.

Maryland localities: Baltimore, Cecil, Calvert, Wicomico, St. Mary's, Harford and Worcester counties.

Family **Scombresocidæ**

SAURY; SKIPPER; BILLFISH

Scombresox saurus, (Walbaum)

Esox saurus, Walbaum, Artedi Pisc. III, 93, 1792, Cornwall; after the Pike of Pennant.

Head 3½; depth 9. D. 9-VI; A. 12-VI; scales 110. Head broad above, narrowed below, tapering anteriorly to the very slender, pointed beak; snout longer than the rest of the head, proportionately shorter in the young; lower jaw longer. Fins all small; caudal fin forked; ventrals midway between base of caudal and front of eye. Air bladder large. Olive brown above, sides and below silvery; a distinct silvery band, as broad as the eye, bounding the dark of the back. Length 18 inches. Temperate parts of the Atlantic Ocean; rather common in schools, on both coasts, especially north of Cape Cod and France; found in the open seas.

Maryland localities: Uhler and Lugger mention it as *Scomberesox scutellatus* from near entrance to Chesapeake Bay, Md.

Family **Belonidæ**

SILVER GAR; NEEDLEFISH

Strongylura marina, (Walbaum)

Esox marinus, Walbaum, Artedi Piscium, III, 88, 1792; after Schöpf.

Head 2 4/5; snout 4½. Eye large, 2½ in postorbital part of head. D. 15; A. 17, vertebræ 44 + 24=68; scales 300. Body slender, not compressed; tail moderately depressed, broader than deep, the lateral line passing into a slight keel which is not black. Head long, flat above, with a broad, rather shallow, scaly median groove. Upper jaw from eye twice the length of rest of head; maxillary not nearly hidden by the preorbital. Teeth sharp; mouth not quite closing. Scales and bones more or less green; pectoral equal to postorbital part of head. Ventrals moderate, midway between preopercle and base of caudal; dorsal and anal somewhat falcate, the last rays always short; caudal fin slightly emarginate. Scales thin and small, 240 before dorsal. Color greenish; sides silvery; a narrow silvery lateral stripe; a dark bar on front of opercle; fins olivaceous. Length four feet. Cape Cod to Texas; very abundant on our Atlantic and Gulf Coasts; often ascending rivers far above tide water, and doubtless breeding in fresh waters.

Maryland localities: Anne Arundel, Cecil, Harford, Kent, St. Mary's and Worcester counties.

HOUND FISH; AGUJON

Strongylura acus, (Lacépède)

Sphyraena acus, Lacépède, Hist. Nat. Poiss., V, 6, pl. 1, fig. 3, 1803, Martinique; from a drawing by Plumier.

Body elongate, not much compressed. Its long beak strong, more elongate than in its near relative *S. raphidoma.* Caudal keel strong; dorsal fin long, beginning behind front of anal, its last rays much elevated in the young, in the adult low; caudal deeply and unequally emarginate; color green above without lateral band; length five feet. Dorsal 23-24; A. 21-22; scales 380. West Indies, occasionally straying northward to New England.

Maryland localities: Anne Arundel, Cecil, Harford, Kent, St. Mary's and Worcester counties.

Family **Sphyrænidæ**

NORTHERN BARRACUDA

Sphyræna borealis, De Kay

Sphyræna borealis, De Kay, N. Y. Fauna, Fishes 37, plate 60, fig. 196, 1842, New York.

Head 3; depth 2 3/5; eye rather small, about 6 in head, scarcely exceeding width of interorbital area. D. V-9; A. I, 9; scales 115 to 130. Body rather slender, subterete, covered with moderate sized scales; head large; maxillary small, less than ½ head, not reaching front of orbit by ½ diameter of eye; lower jaw with fleshy tip, bluntly conical. Interorbital area convex; median groove very shallow, divided by a distinct longitudinal ridge, especially well defined immediately before nostrils; supraocular ridge striate; preocular ridge moderate. Premaxillary teeth small, about 40 in number; front of premaxillary with two pairs of large teeth (sometimes accompanied by smaller ones), canine-like; anterior smallest, directed downward, posterior ones downward and backward; anterior palatines larger than premaxillary teeth and more compressed and widely set; posterior ones small and closely set; order of teeth on lower jaw reversed, but similar to those on the palatines, and smaller, about 10 in series; large tooth near tip of lower jaw present. Origin of dorsal over or slightly in advance of ventrals, well behind point of pectorals; distance between dorsal fins 5¼ in length of body; distance from tip of snout to spinous dorsal 2 1/10 in body; scales moderate, somewhat larger behind soft dorsal and anal; cheeks and opercles scaly; small embedded scales on upper parts of head. Color olivaceous; silvery below; young with dusky blotches across the back and along the lateral line. Atlantic Coast of United States from Cape Cod to Cape Fear, rather common northward; rarely used for food. Length rarely more than a foot.

Maryland localities: Worcester county.

GREAT BARRACUDA

Sphyræna barracuda, (Walbaum)

Esox barracuda, Walbaum, Artedi Piscium, III, 94, 1792, after Catesby.

Head 3; depth 2 in head; eye rather small, about 6 in head, equal to width of interorbital area. D. V-I, 9; A. I, 9; scales 10-75 to 85-10, the cross series counted from lateral line to front of dorsal and anal fins respectively. Body oblong, slightly compressed, covered with large scales. Head large; maxillary large; nearly ½ length of head, its posterior margin reaching past front of orbit. Lower jaw with fleshy tip, bluntly conical. Interorbital area concave, with a shallow median groove (as wide as pupil, at posterior edge of orbit), divided by a ridge in front and behind. Supraocular ridge bony and striate. Preocular ridge present. Teeth large; premaxillary teeth small, little compressed, irregularly set, nearly uniform in size, somewhat thicker and shorter posteriorly; premaxillary with two pairs of very large compressed teeth, their length more than half width of eye; anterior ones directed downward; posterior ones downward and backward; teeth in lateral series of lower jaw small anteriorly, increasing gradually backward, when they nearly equal those on palatines; palatine teeth similar to those on lower jaw, arranged in reversed order. Distance from tip of snout to front of dorsal 2 2/7 in body; second dorsal spine longest, 1⅓ in snout; second dorsal and anal equal; anal inserted under first third of soft dorsal; caudal forked, upper lobe the longer; pectorals reaching beyond front of dorsal, 2½ in head; origin of first dorsal slightly behind the ven-

trals; cheeks and opercles scaly, about 12 rows of scales on cheeks; upper part of head with small, embedded scales. Color silvery, darker above; sides in young with about 10 dark blotches which break up and disappear with age. Some inky spots, usually on posterior part of body, are very conspicuous in both old and young specimens. Soft dorsal, anal and ventral fins black, except on margins. Pectorals plain, except upper part of margin, which is black. Fins of very young specimens nearly plain. West Indies and Brazil, north to New Jersey; very common in the tropics. The largest and most voracious of the Barracudas, reaching a length of 6 feet; valued as food; sometimes dangerous to bathers, being fierce as a shark.

Maryland localities: Worcester county.

Family **Atherinidæ**

ROUGH SILVERSIDE

Kirtlandia vagrans, (Goode and Bean)

Chirostoma vagrans, Goode & Bean, Proc. U. S. Nat. Mus., 1879, 148, Pensacola, Fla.

Head 4 2/5; depth 5¼. D. V-1, 7; A. I, 17; scales 43-6 to 48-7. First dorsal very small, its insertion over front of anal, midway between base of caudal and posterior angle of opercle; distance from its front to front of second dorsal ⅔ head. Pectorals slightly shorter than head. Vertical fins with large scales. Scales firm, adherent, then edges crenate or laciniate, feeling very rough to the touch. Scales of head large. Color in life, light greenish above, the lateral band broad, covering two half rows of scales, becoming narrow posteriorly; sides and belly silvery; tip of snout and of lower jaw yellow, soiled with blackish; each scale of back with one to three dark points, these forming about five conspicuous streaks as seen from above; caudal yellow with dark punctulations, its margin dusky; dorsal and pectorals somewhat dusky, lower fins white; the anal with dark points at base. Length four inches. Coast of Gulf of Mexico, Florida to Texas, rarely northward; very abundant in schools along the sandy beaches.

Maryland localities: Anne Arundel and Harford counties.

FRESH-WATER SILVERSIDE

Menidia beryllina, (Cope)

Chirostoma beryllinum, Cope, Trans. Amer. Phil. Soc., 1866, 403, Potomac River at Washington.

Head 4¼ to 4⅓; depth 5 to 5½; eye very large, 3. Dorsal V-I, 10, rarely V-I, 11 or V, 1, 9; anal I, 15 to 18, usually I, 16 or 17; scales 38 to 40-8. Body very slender. Mandible slightly projecting. First dorsal well in advance of second, inserted just before the vent, about midway between base of caudal and tip of snout. Scales entire; fins not scaly. Greatest depth of body 1½ in distance from nape to spinous dorsal. Very pale olive, with a sharply defined silvery band found anteriorly on the lower half of the fourth row; toward the middle, opposite the dorsal fins, it is on the central portion of the fourth row and on the margins of the scales of the third and fifth rows, rising toward the tail, where it covers the lower half of the third and upper half of fourth rows; back and sides with scarcely any dark spots.

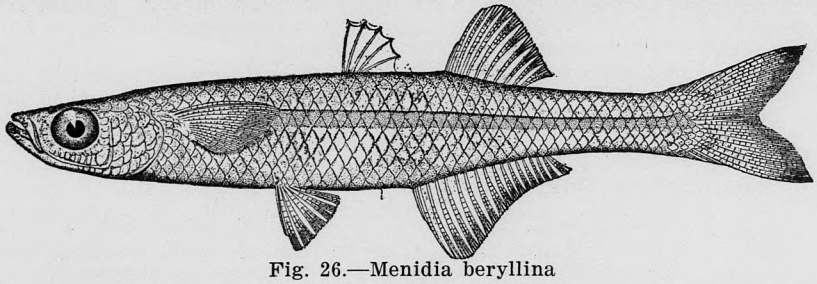


Fig. 26.—Menidia beryllina

Maryland localities: Anne Arundel, Baltimore, Cecil, Harford, Kent, St. Mary's and Worcester counties. Originally described from the Potomac at Washington.

MARINE SILVERSIDE

Menidia notata, (Mitchill)

Atherina notata, Mitchill, Trans. Lit. and Phil. Soc., N. Y., I, 1815, 446, New York.

Head 5; depth 6. D. IV-I, 8; A. I, 23; scales 46-10. Eye large, 3½ in head, about as long as the snout. Scales with entire edges. Jaws equal. First dorsal large, inserted in front of the anal, over the vent, about midway between snout and base of caudal. Distance between dorsals ⅔ length of head. Pectoral scarcely shorter than head, reaching past base of ventrals, which do not reach the vent or the front of the dorsal. Body slenderer and more compressed than in *Menidia menidia.* Teeth in few series, some of them larger. Transparent green, with a lateral silvery band half the width of the eye; scales above with spots along their edges, so that their outlines are clearly defined; chin speckled. Length five inches. Atlantic Coast of United States, chiefly northward; south to Virginia; very abundant.

Maryland localities: Anne Arundel, Baltimore, Calvert, Charles, Kent, St. Mary's and Worcester counties.

Family **Mugilidæ**

COMMON MULLET; STRIPED MULLET; CEFALO; MANCHO; MACHUTO; LIZA; CABEZUDA

Mugil cephalus, (Linnæus)

Mugil cephalus, Linn., Syst. Nat., ed. X, 316, 1758, Europe; based on Artedi.

Head 4 1/6 (5 1/3 in total with caudal); depth 3 5/6 (5 in total). D. IV-1, 8; A. III, 8 (very rarely III, 7); scales 41-13. Body rather robust, somewhat compressed, its depth moderate. Snout rather narrow and acutish, its upper profile little less oblique than lower. Interorbital space slightly convex, 2 2/5 in head. Upper lip rather thin. Space at the chin between the mandibulary bones oblanceolate, acutish posteriorly. Preorbital narrow, not nearly covering the maxillary. Eyes hidden anteriorly and posteriorly by a broad adipose membrane. Teeth close set, rather small, but evident. Scales rather small; about 23 large scales between origin of dorsal and tip of snout; scales on top of head slightly enlarged; soft dorsal and anal with very few scales. First dorsal spine usually a little more than half head, its length subject to some variation. Margin of soft dorsal concave, the seventh ray shortest, 2½ times in length of second or longest ray; anal similar to soft dorsal, but less concave. Pectoral reaching nearly to front of spinous dorsal, its insertion above axis of body. Color dark bluish above; sides silvery, with conspicuous dark stripes along each row of scales; pale yellowish below; ventrals yellowish, the other fins more or less dusky. Length 1 to 2 feet.

Coasts of southern Europe and northern Africa; Atlantic Coast of America, from Cape Cod to Brazil; Pacific coast in great schools in bays, lagoons and sheltered waters from Monterey to Chili; everywhere very common; a food fish of considerable importance, the flesh of fair quality.

Maryland localities: Worcester county. Uhler and Lugger mention it in the Baltimore market from southern Chesapeake Bay. Abundant in bays and sounds from Florida to Cape Cod.

WHITE MULLET; BLUE-BACK MULLET; LIZA

Mugil curema, (Valenciennes)

Mugil curema, Valenciennes, Hist. Nat. Poiss., XI, 87, 1836, Brazil; Martinique; Cuba.

Body moderately elongate, similar to that of the more common form *M. cephalus.* Snout rather narrow and pointed. Interorbital slightly convex, upper lip rather thick, eyes hidden by broad adipose membrane. Teeth small, thick set, distinctly visible to the naked eye. Scales rather small, about 23 between tip of snout and origin of dorsal; soft dorsal and anal densely scaled. Caudal forked.

Color dark green above with bluish reflections; silvery below; no dusky streaks along sides. Dorsal 4-1, 8; A. 3-9; scales 38 to 12. Cape Cod to Brazil, and the Pacific Coast to South America.

Maryland localities: Worcester county. In Chesapeake Bay not far remote from the ocean, according to Uhler and Lugger.

Family **Percopsidæ**

SAND ROLLER; TROUT PERCH

Percopsis guttatus, (Agassiz)

Percopsis guttatus, Agassiz, Lake Superior, 286, 1850, Lake Superior.

Head 3 4/5; depth about 4 1/3. D. II 9; A. I, 7; V. I, 8; scales 50. Head slender and conical; mouth small, subinferior, maxillary not nearly reaching front of orbit. Caudal peduncle long and slender. Length six inches. Potomac River to Ohio River, Kansas and northward; very abundant in the Great Lakes, in all streams tributary to Hudson Bay, and Red River of the North, occasionally taken throughout the upper Mississippi Valley.

Maryland localities: Montgomery county. Uhler and Lugger mention it from the lower Potomac, and Prof. Baird recorded it from the Susquehanna River.

Family **Aphredoderidæ**

PIRATE PERCH

Aphredoderus sayanus, (Gilliams)

Scolopsis sayanus, Gilliams, Jour. Ac. Nat. Sci. Phila., IV, 1824, 81, near Philadelphia.

Head 3; depth 3. D. III, 11 to IV, 10; A. II, 6; V. 7; B, 6; scales 45 to 60. Color dark olive, profusely speckled with dark points which often make blackish streaks along rows of scales; two blackish bars at base of caudal, between which is a light bar. Length five inches. Sluggish streams and bayous from New York coastwise to Texas, and throughout the Mississippi basin in lowlands and streams with alluvial bottoms; locally abundant, variable. The singular variations in the position of the vent have given rise to two nominal species and a nominal genus. Northwestern specimens, Ohio to Arkansas (var. *isolepis*) have usually smaller scales than the true *sayanus*, which has

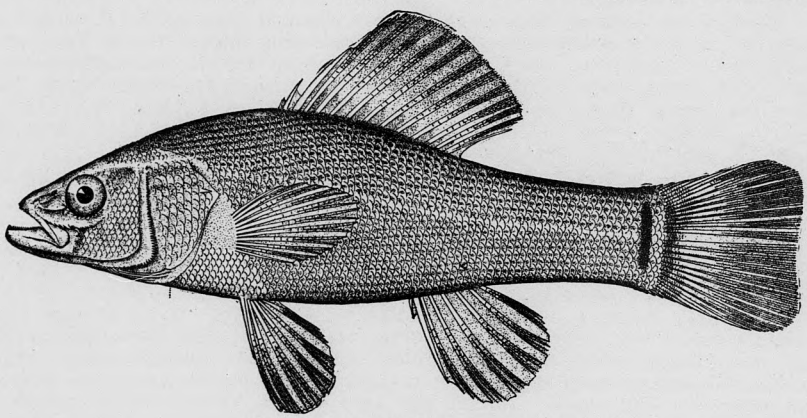


Fig. 27.—Aphredoderus sayanus

45 to 55; *isolepis* usually 55 to 60; both forms are extremely variable and probably no constant differences exist.

Maryland localities: Prince Georges county. Quite a number have been collected for the U. S. National Museum in the Patuxent near Laurel, by Ernest Marshall.

Family **Scombridæ**

COMMON MACKEREL

Scomber scombrus, (Linnæus)

Scomber scombrus, Linn., Syst. Nat., ed. X, 297, 1758, Atlantic.

Head 3; depth 3½; eye less than snout, 5 in head. D. XI-12-V; A. I, 11-V. Skull with inconspicuous parallel ridges; suborbital somewhat triangular, posterior border of eye not covered by radiating scales; first dorsal about as

high as long, height of second about ⅓ its length; a groove connecting dorsals; air bladder wanting. Snout rather long and pointed, compressed. Mouth large, maxillary extending to anterior margin of orbit. Ventrals and pectorals short, the former nearly half length of head. Lustrous dark blue above, with about 35 wavy blackish transverse streaks; below silvery; base of pectorals dark; base of preopercle with about 15 or 20 small black specks or mucous pores, generally arranged in a single row; both dorsals margined with white. Length 18 inches. North Atlantic; abundant on both coasts, north to Norway

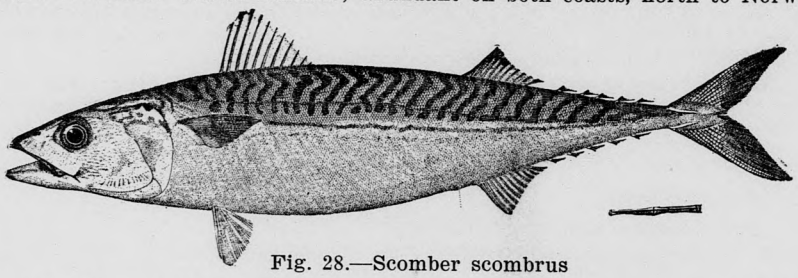


Fig. 28.—Scomber scombrus

and Labrador; south to Spain and Cape Hatteras. One of the best known food-fishes of Europe and America.

Maryland localities: Worcester county and lower Chesapeake Bay in Maryland.

CHUB MACKEREL; THIMBLE EYE

Scomber colias, (Gmelin)

Scomber colias, Gmelin, Syst. Nat., 1329, 1788, Sardinia; based on Lacerta of Cetti.

Head rather pointed, body slightly more rounded than in the *S. scombrus*. Posterior border of eye covered with large radiating scales; top of head with a large translucent area. Dark blue; sides soiled silvery, in the adult showing dusky cloudings; back with about 30 dark wavy streaks, extending to just below the lateral line; eye large. Head 3; depth 3¼. D. IX or X, 12-V; A. 12-V. L. 12. Warm seas, not rare, and a food fish of much less value than the mackerel. Abundant in bays and sounds from Florida to Cape Cod.

Maryland localities: Worcester county. Uhler and Lugger mention it in the Baltimore market from southern Chesapeake Bay.

TUNNY; HORSE-MACKEREL; GREAT ALBACORE; TUNA

Thunnus thynnus, (Linnæus)

Scomber thynnus, Linn., Syst. Nat., ed. X, 297, 1758, Europe.

Head 3¾; depth 4. D. XIV-I, 13-IX; A. I, 12-VIII. Body oblong, very robust; corselet well developed, extending farther back than pectorals; caudal keel extending forward to second finlet from caudal. Mouth rather large; maxillary reaching pupil; posterior margin of preopercle somewhat shorter than inferior. Eye small. Dorsal and anal falcate, short, two in height of first dorsal; ventrals longer than anal; caudal very widely forked; pectorals short, reaching to about ninth dorsal spine. Dark blue above; below grayish, with silvery spots. Pelagic, found on all warm coasts; north to England, Newfoundland, San Francisco and Japan. The largest of the Scombridæ reaching a length of ten feet or more and a weight of 1,500 pounds. The flesh is excellent, that even of very large individuals being of fine flavor. The subject of extensive fisheries in Europe.

Maryland localities: On the coast, according to Uhler and Lugger.

BONITO,

Sarda sarda, (Bloch)

Scomber sarda, Bloch, Ich., X, 35, pl. 334, 1793, Europe.

Head 3¾; depth 4. D. XXI-I, 13-VIII; A. 13-VII; P. 10. Body elongate moderately compressed, robust, corselet distinct, small, not extending beyond pectoral. Teeth moderate, slightly compressed, about 30 in each jaw. Gill

rakers rather small, 11 or 12 below angle. Maxillary reaching beyond orbit. Lateral line slightly undulating, with nowhere a decided curve. Dark steel blue above, with numerous narrow dark stripes from the back obliquely downward and forward from the back; silvery below. Length 2½ feet; weight from 10 to 12 pounds. Atlantic Ocean on both coasts, north to Cape Cod; very abundant; a food fish of rather low grade. This species seems to inhabit the open ocean, approaching the shores for food or purposes of spawning.

Maryland localities: Worcester county.

SPANISH MACKEREL

Scomberomorus maculatus, (Mitchill)

Scomber maculatus, Mitchill, Trans. Lit. and Phil. Soc., N. Y., I, 1815, 426, New York.

Head 4½; depth 4½. D. XVII-18-IX; A. II-17-IX; maxillary 1 4/5 in head; eye 4¾; pectoral 1¾; ventral 4½, dorsal and anal lobes subequal, 2. Body elongate, its dorsal and ventral outlines equal; profile straight from snout to dorsal; head small and pointed; mouth large, oblique jaws equal; maxillary reaching posterior margin of orbit; teeth large, compressed and sharp, their formula being 24-24 to 32-32; gill rakers 2 + 11. Soft dorsal inserted in advance of anal a distance about equal to diameter of eye; lateral line undulating, with

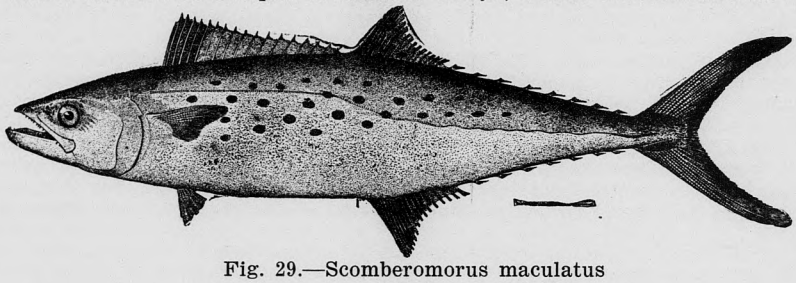


Fig. 29.—Scomberomorus maculatus

about 175 pores. Color silvery, bluish above; sides with many elliptical spot of dull orange color, two rows of these spots below lateral line and one row above; spinous dorsal white at base, black above; soft dorsal tinged with yellowish, its margins black; anal white; posterior side of pectoral black, anterior side yellowish with black borders; caudal blackish. Both coasts of North America, appearing in large but very irregular schools in the Gulf of Mexico and along the Carolina Coast; ranging north in the fall as far as Cape Ann, and south to Brazil; rare or unknown in Cuba. Weight 8 or 9 pounds. One of the very best food-fishes in the United States.

Maryland localities: Somerset, Calvert, St. Mary's and Worcester counties.

SIERRA; PINTADO

Scomberomorus regalis, (Bloch)

Scomber regalis, Bloch, Ichthyol., pl. 333, 1795, Martinique; after a drawing by Plumier.

Head 4¼; depth 4½. D. XVII-I, 15-VIII; A. II, 14-VIII. Body rather elongate, its dorsal and ventral curves about equal. Lateral line descending obliquely, undulate along the tail. Mouth large; maxillary reaching to below eye; angle of preopercle produced backward, pectorals scaly; caudal peduncle rather slender; its least depth 5½ in head; caudal less widely forked than in *maculatus*. Teeth triangular, strongly compressed, about 40 in each jaw. Pectoral scaly. Silvery; sides with two blackish longitudinal bands crossing lateral line below soft dorsal, both posteriorly broken with longitudinal spots; above and below these numerous brownish spots in rows persistent in the adult; anterior portion of spinous dorsal black. Cape Cod to Brazil; not very common on our Atlantic Coast; abundant in Cuba, closely allied to *Scomberomorus maculatus*, from which most fishermen do not distinguish it. It reaches a length of five or six feet and a weight of 20 pounds, it being also an excellent food-fish.

Maryland localities: Worcester county.

Family **Xiphiidæ**

COMMON SWORDFISH; ESPADA; ESPADON; EMPERADOR

Xiphias gladius, (Linnæus)

Xiphias gladius, Linnæus, Syst. Nat., ed. X, 248, 1758, Europe.

Head about 2¼; depth about 5½; snout three in length. D. 40-4; A. 18-14; Vertebræ 14 + 12. Cleft of eye extending beyond eye. Color dark metallic purplish above, dusky below; "Sword" almost black above, below lighter; fins dark with silvery sheen. Atlantic Ocean on both coasts, most abundant between Cuba and Cape Breton; not rare off Cape Cod and the Newfoundland banks; rather common in southern Europe; also found in the Pacific, occasionally taken about Santa Barbara Islands, but not elsewhere recorded from the eastern Pacific. The object of extensive fisheries in the Atlantic.

Maryland localities: Not uncommon at Ocean City.

Family **Carangidæ**

RUDDER FISH; SHARK'S PILOT

Seriola zonata, (Mitchill)

Scomber zonatus, Mitchill, Trans. Lit. and Phil. Soc., N. Y., I, 1815, 427, New York Bay.

Head 3½; depth 3⅓. D. VII-I, 38; A. II-I, 21. Head longer than deep; profile descending in a gentle curve; top of head to base of dorsal fin compressed. Mouth small, nearly horizontal, maxillary reaching to below the middle of orbit. Pectorals small, rounded, as long as eye and snout; ventrals ⅔ length of head. Vent behind middle of body. Bluish above, white below; sides with about six broad black bars, these forming three large blotches on the dorsal and two on the anal; the bars growing faint or disappearing with age; an oblique dark band from the spinous dorsal to the eye, the space above this

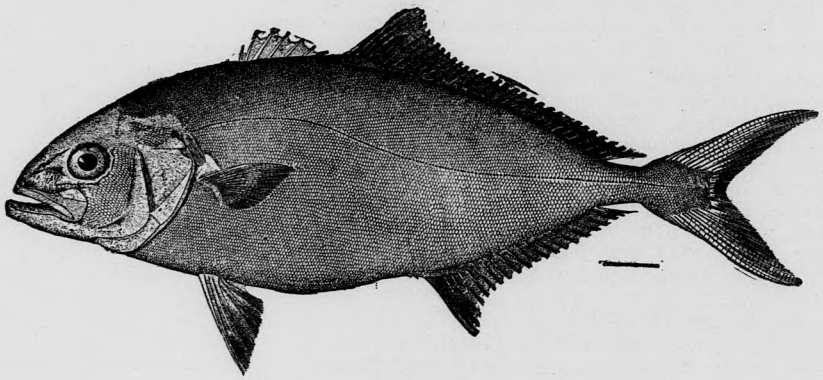


Fig. 30.—Seriola zonata

olivaceous; spinous dorsal black; ventrals mostly black. Length two to three feet. Cape Cod to Cape Hatteras; the banded young rather common northward.

Maryland localities: Worcester county.

CREVALLE; TORO; HORSE CREVALLE; CAVALLY; JACK

Caranx hippos, (Linnæus)

Scomber hippos, Linnæus, Syst. Nat., ed. XII, 494, 1766, Charleston, S. C.

Head 3½; depth 2½; lateral line (scutes) about 30. D. VIII-I, 20; A. II-I, 17. Body oblong the anterior profile very strongly arched. Head large and deep. Mouth large, low; lower jaw prominent; maxillary extending to nearly opposite posterior border of eye, 2½ in head. Teeth in upper jaw in a broad villiform band; an outer series of large wide set conical teeth; teeth of

lower jaw in one row, a distinct canine on each side of symphysis; villiform teeth on vomer, palatines, pterygoids and tongue. Lateral line with a wide arch, its length 1⅓ in straight part, the angle under fifth dorsal ray; plates not covering all of straight part. Dorsal spines short, rather stout; gill rakers stout, rather long, 15 below angle. Occipital keel sharp. Eye not very large. Pectoral falcate 1/5 longer than head. Olivaceous above, sides and below golden. Warm seas, generally abundant; found on both coasts of tropical America, north to Cape Cod and Gulf of California, also in the East Indies; a large and well known food fish. More abundant northward on our coast than any other species of the genus except *Caranx crysos*. Easily distinguished by its canines, its naked breast, and the color markings.

Maryland localities: Worcester county. Reported from Chesapeake Bay by Uhler and Lugger.

HARD-TAIL; RUNNER; JUREL; YELLOW MACKEREL; COJINERA; CREVALLE

Caranx crysos, (Mitchill)

Scomber crysos, Mitchill, Trans. Lit. & Phil. Soc., N. Y., I, 1815, 424, New York.

Head 3¾; depth 3¼. D. VIII-I, 24; A. II-I, 19; lateral line 50 (scutes). Body oblong, moderately elevated, the dorsal and ventral outlines about equally arched. Profile forming a uniform curve. Snout rather sharp. Mouth slightly oblique, a little below axis of body. Maxillary reaching about to middle of orbit. Teeth comparatively large; a single series in lower jaw; upper jaw with an inner series of smaller teeth; no canines; teeth on vomer, palatines, and tongue. Eye rather small, shorter than snout, 3½ in head. Gill rakers long and numerous. Pectoral as long as head, barely reaching anal, rarely longer than head in certain specimens from Key West, possibly referable to *C. caballus*. Scales moderate; cheeks and breast scaly. Lateral line with a weak arch anteriorly, which is about half length of straight portion. Lateral scutes numerous, developed on whole straight part of lateral line. Greenish olive, golden yellow or silvery below; black blotch on opercle; fins all pale. Length one foot or more. Cape Cod to Brazil; generally abundant, common farther north than any of the other species of *Caranx*. A well known food fish rarely exceeding a foot in length, not found in the Pacific, where it is replaced by *Caranx caballus*.

Maryland localities: Worcester county and southern Chesapeake Bay.

THREAD FISH; COBBLER FISH

Alectis ciliaris, (Bloch)

Zeus ciliaris, Bloch, Ichthyol., VI, 29, pl. 29, 1788, East Indies, young.

Body rhomboid, very deep and strongly compressed, covered with minute embedded scales, not visible. Scutes as in *Caranx*, much less developed. Mouth moderate, very oblique in the young, nearly horizontal in the adult. The name Thread Fish is suggested by the first dorsal and anal rays, which are exceedingly long in the young, much longer than body, somewhat shorter with age. Lateral line with curved portion about equal to the posterior half or straight part. Ventrals broad, pectorals falcate, longer than head, color bluish above, silvery below, often golden yellow after capture; a dark blotch on opercle, a similar blotch on dorsal and anal in front. In life this is one of the most beautiful species of its family, ranging on both coasts of tropical America, north to Cape Cod and Mazatlan. It is a food fish of very good flavor.

Maryland localities: Worcester county.

JOROBADO; MOONFISH; HORSEFISH; BLUNT-NOSED SHINER

Vomer setapinnis, (Mitchill)

Zeus setapinnis, Mitchill, Trans. Lit. and Phil. Soc., N. Y., I, 1815, 384, New York.

Head 3¼; depth 2 in adult; 1¼ to 1¾ in young. D. VIII-I, 21 or 22; A. II-I, 19 or 20; scutes 20. Body oblong, rhombic, less elevated than in *Selene vomer;* profile anteriorly nearly vertical, highest above the eye; snout somewhat protruding; belly mostly arched in the young; mouth oblique; maxillary reaching vertical from front of orbit. Ventral fins minute; dorsal and anal very low, especially in the adult, the long rays disappearing very early; pectorals falcate,

about as long as head. Greenish above, below golden or silvery. Young with a black blotch at origin of straight part of lateral line. Tropical America on both coasts; from Maine to Brazil and Cape San Lucas to Peru; generally common southward, the young coming northward in the Gulf stream; also in Western Africa.

Maryland localities: Ocean City and Sinnepuxent Bay. Lower Chesapeake Bay, according to Uhler and Lugger.

MOON-FISH; JOROBADO; LOOK-DOWN; HORSEHEAD

Selene vomer, (Linn.)

Zeus vomer, Linn., Syst. Nat., ed. X, 1758, 266, America.

Head 3; long dorsal rays 2. Pectoral 2¾; long anal rays 2⅔; depth 1½, the young much deeper. D. VII-I, 23; A. II-I, 18. Anterior profile from tip of snout to occiput almost perfectly straight in the adult. Diameter of eye, length of opercle, and distance from eye to profile about equal; eye two in maxillary, 2½ in preorbital; mandibles very deep, the dentary bones thin, approximate; one or two of the dorsal spines greatly elongate and filamentous in the young, short in the adult; ventrals variable in length; usually about as long as the eye in the adult, variously elongate in partly grown specimens. Color uniform silvery in the adult. Our observations of this species tend to confirm the correctness of Dr. Lutken's views (Spoila Atlantica 139) as to the transformations incident to its growth. Tropical America on both coasts from Cape Cod to Brazil, and from lower California to Peru. Very common southward on sandy shores, both in the Atlantic and Pacific. The Pacific Coast form *brevoortii pacificus* is not evidently different from *Selene vomer*.

Maryland localities: Worcester county. Near mouth of the Potomac, Sinnepuxent and southern Chesapeake Bay, according to Uhler and Lugger.

ROUND PAMPANO; PALOMETA

Trachinotus falcatus, (Linnæus)

Labrus falcatus, Linnæus, Syst. Nat., ed. X, 1758, 284, America; Museum de Geer.

Head 3¾; depth 1⅘. D. VI-I, 19; A. II-I, 18. Body broadly ovate, moderately compressed, profile very evenly convex from procumbent spine to level of upper edge of eye, where it descends almost vertically. The vertical portion is about 1⅓ times the eye; length of snout nearly equal to eye; mouth nearly horizontal; maxillary reaching to vertical from middle of eye, its length 2⅔ in jaw; jaws without teeth in adult; dorsal spines short and thick, not connected by membrane in adult; ventrals short, their tips scarcely reaching half way to anterior anal spine, three in head; caudal widely forked; lobes about 2⅔ in length; dorsal and anal fins falcate; anterior rays reaching almost to posterior end of fins; in adults dorsal lobe 2⅔, anal lobe 4½ in length of body. Color bluish above, silvery below; lobes of dorsal black in young; in adults the fins are all bluish with lighter tips. The young differ from the adult as above described in the following respects. The profile is scarcely convex; snout shorter and less vertical; spines much longer and connected by membranes; lobes of vertical fins shorter; dorsal lobe with black fins all much darker; jaws with bands of villiform teeth; eye larger. West Indies; Cape Cod to Brazil; abundant southward; ranging north in the Gulf Stream to Woods Hole the adult rarely taken northward. As a food-fish this species is less valuable than its congener *carolinus*.

Maryland localities: St. Mary's and Worcester county.

COMMON PAMPANO

Trachinotus carolinus, (Linnæus)

Gasterosteus carolinus, Linnæus, Syst. Nat., ed. XII, 490, 1766, Carolina.

Head 4; depth 2 1/3 to 2 2/5. D. VI-I, 25; A. II-I, 23. Body oblong, comparatively robust; greatest thickness three in greatest depth. Snout from mouth to horizontal from upper edge of eye nearly vertical, somewhat bluntly rounded; profile from upper edge of snout to procumbent spine evenly convex. Mouth nearly horizontal, maxillary reaching to vertical from middle of eye, its length 2⅞ in head; eye 4½ in head, about as long as snout. Jaws without teeth in adult. Ventrals reach ⅗ distance to vent, about 2 in pectorals, 2½

in head. Dorsal and anal fins falcate, anterior rays nearly reaching middle of fins, when depressed; dorsal lobe 4½ in body; anal 5½ in length of body. Color bluish above, silvery or slightly golden below; pectorals and anals light orange shaded with bluish; caudal and upper portion of caudal peduncle with bluish reflections. Length 18 inches. South Atlantic and Gulf coasts of United States, ranging north to Cape Cod on sandy shores, very common southward, rare or accidental in the West Indies and in Brazil. The most valued food fish in our southern waters, its flesh rich, firm and delicate, superior to all others of its genus or family. On the Pacific Coast it is scarcely known as a food fish, perhaps from its scarcity.

Maryland localities: Worcester county. Chesapeake Bay.

Family **Pomatomidæ**

BLUEFISH; SNAP MACKEREL; SKIPJACK; FAT-BACK

Pomatomus saltatrix, (Linnæus)

Perca saltatrix, Linnæus, Syst. Nat., ed. X, 1758, i, 293, Carolina.

Head 3⅓; depth 4. D. VIII-I, 25; A. II-I, 26; scales 95. Body robust, moderately compressed; belly compressed to a bluntish edge. Head deep; top of head and a ridge on each side above the cheeks naked. Cheeks much longer than opercles. Pectorals placed rather low, their length a little more than half that of head. Coloration bluish or greenish above, silvery below; a

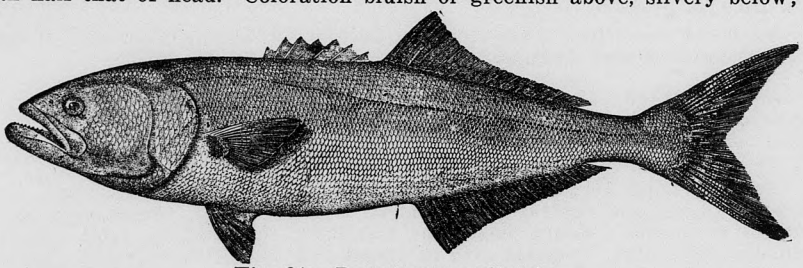


Fig. 31.—Pomatomus saltatrix

blackish blotch at base of pectoral. Length three feet. Atlantic and Indian Oceans; widely distributed; of late years very abundant on our Atlantic Coast; a large voracious fish, extremely destructive to other fishes; highly valued for food, the flesh being most excellent. Occasional in the Mediterranean.

Maryland localities: Somerset, Calvert, Worcester, Anne Arundel (Annapolis), Baltimore (Carrol's Island in Gunpowder River), Dorchester (Sharpe's Island), Harford, St. Mary's (Piney Point and Leonardtown), Kent, and Talbot (Easton) counties.

Family **Rachycentridæ**

CRAB-EATER; COBIA

Rachycentron canadum, (Linn.)

Gasterosteus canadus, Linnæus, Syst. Nat., ed. XII, 491, 1766, Carolina.

Head 4¼; depth 5 2/3. D. VIII-I, 26; A. II, 25. Head much depressed; mouth moderate, the short maxillary reaching front of orbit. Pectorals broad and falcate; caudal deeply emarginate, the upper lobe slightly the longer. Lateral line wavy and irregular, descending posteriorly. Olive brown, sides

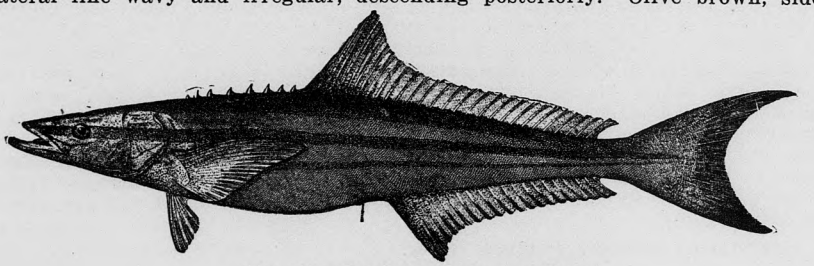


Fig. 32.—Rachycentron canadum

with a distinct broad band of darker and less distinct band above and below it; silvery below. Length five feet. Warm seas; common on our Atlantic Coast in summer, especially in Chesapeake Bay and southward; north to Cape Cod; not recorded from the eastern Pacific, but abundant in the East Indies.

Maryland localities: Better known as "Bonito" and Crabeater; common to parts of Chesapeake Bay.

Family **Stromateidæ**

HARVEST FISH

Seserinus paru, (Linnæus)

Seserinus paru, Linnæus, Syst. Nat., ed. X, 1758, 248, Jamaica.

Head 3; depth 1½. D. III, 45; A. II, 43; scales about 90; vertebræ 15 + 15. Body suborbicular, bounded by even curves; mouth very small, oblique; maxillary reaching front of orbit. No pores along sides of back. Dorsal and anal fins falcate, the length of their longest rays greater than head; pectorals much longer than head, reaching halfway to caudal; caudal lobes equal; scales thin and deciduous, not very small. Pelvic spine crenulate in young. Greenish above, golden yellow below. Length six inches. South Atlantic Coast of United States and West Indies; not rare southward, ranging from Cape Cod to Jamaica and also to Brazil; often found swimming beneath the Portuguese man-of-war with *Nomeus gronovii*.

Maryland localities: Anne Arundel, Calvert, St. Mary's, Somerset, Wicomico, Dorchester, Queen Anne and Worcester counties.

BUTTER FISH

Poronotus triacanthus, (Peck)

Stromateus triacanthus, Peck, Mem. Amer. Acad. Sci., II, part 2, 1800, 48, pl. 2, fig. 2, Piscataqua River New Hampshire.

Head 4; depth 2⅓; eye 4. D. III, 45; A. III, 38. Body oval, much compressed. Dorsal and ventral outlines about equally curved. Snout very blunt, rounded in profile. Mouth small, the maxillary not reaching orbit. Caudal peduncle very short; anterior rays of dorsal and anal little elevated. Lateral line high, a series of conspicuous pores above it near the base of dorsal. Pectorals much longer than broad. Gill rakers rather long, ⅔ diameter of eye. Bluish above, silvery below. Length 10 inches. Maine to Florida; very abundant northward; rare and found in deep water south of Cape Hatteras; an excellent pan fish of fine flavor.

Maryland localities: Baltimore, Calvert, Somerset, Wicomico, Dorchester, Queen Anne, and Worcester counties.

Family **Centrarchidæ**

SPHAGNUM SUNFISH

Enneacanthus obesus, (Girard)

Pomotis obesus, Girard, Proc. Bost. Soc. Nat. Hist., V, 1854, 40, Hingham, Mass.

Head 2 2/3; depth 1 4/5; eye 3¼ in head. D. IX, 10; scales 4-32-10, the pores developed usually on about 20 scales, but sometimes on nearly all of them. Body oblong, ovate, elliptical. Scales large, little crowded. Gill rakers + 9 or 10. Dorsal spines 2½ in head, as long as from snout to posterior margin of eye; anal fin large; ventral spine not reaching vent, its first ray not reaching the base of the last anal spine; caudal fin moderate, about as long as from snout to middle of opercle; opercular spot rather large, more than half the size of eye, velvet black, bordered with purple. Cheeks with four rows of scales. Color olivaceous with 5 to 8 well-defined blackish cross bars, not disappearing with age; spots on body and fins purplish or golden; cheek with lines and spots; a dark bar below eye. Length three inches. Charles River, Mass., to Florida; abundant in sluggish streams near the coast; usually larger in size and duller in color than the next, the two closely related, but apparently not intergrading.

Maryland localities: Potomac River.

BLUE-SPOTTED SUNFISH

Enneacanthus gloriosus, (Holbrook)

Bryttus gloriosus, Holbrook, Jour. Ac. Nat. Sci., Phila., 1855, 51, Cooper River, S. C.

Head 2¾; depth 2¼; eye 3¼ in head. D. IX, 10; A. III, 9; scales 3-30-9. Body comparatively elongate. Mouth moderate, very oblique, the maxillary reaching just past front of orbit. Dorsal spines medium; soft rays in the males somewhat elevated, reaching to or beyond the base of the caudal; the longest soft ray as long as from snout to front of opercle or as long as head; fins in females all lower; pectoral fin reaching nearly to middle of anal. Gill rakers x + 9 or 10. Lateral line usually, but not always complete. Color dark olive; young with traces of narrow vertical, darker bars; ear flap with a blue border and a pearly spot in front; a dark bar about width of pupil extending obliquely downward below the eye; sides of head, whole body and vertical fins in the males, with round bright blue spots arranged in irregular rows, these spots most distinct on the cheeks and opercles and on the lower part of the sides; females duller, with larger and fainter spots more regular in position; a dark bar below eye. Length 2¾ inches. New Jersey to Florida, in clear, sluggish streams; a beautiful little fish.

Maryland localities: Anne Arundel, Baltimore, Cecil, Harford, Kent, Talbot and Somerset counties

BLACK-BANDED SUNFISH

Mesogonistius chætodon, (Baird)

Pomotus chætodon, Baird, Ninth Smithsonian Rep., 1854, 324, Cedar Swamp Creek, N. J.

Head 3; depth 1⅔; eye large 3 in head. D. X. 10; A. III, 12; scales 4-28-10. Body suborbicular, compressed. Head moderate. Mouth very small, maxillary reaching nearly to the eye. Cheeks with three or four rows of scales. Fins rather large; dorsal fin high in front. Gill rakers short x + 10 or 11. Pectoral 1⅓ in head; fourth dorsal spine 2 to 2½. Coloration clouded straw color, side with irregular black vertical bars. Length 4 inches. New Jersey to Maryland, in sluggish streams. A very handsome little fish; locally abundant, but very narrow in its range.

Maryland localities: Cypress swamps.

YELLOW BELLY; REDBREAST BREAM

Lepomis auritus, (Linnæus)

Labrus auritus, Linn. Syst. Nat., ed. X, 283, 1758, Phila.

Head (without flap) 2¾ to 3; depth 2 to 2½; eye 4 to 4½ in head. D. X, 11 or 12. A. III, 8 to 10; scales 6-43 to 48-15, 40 to 45 pores; 7 rows of scales

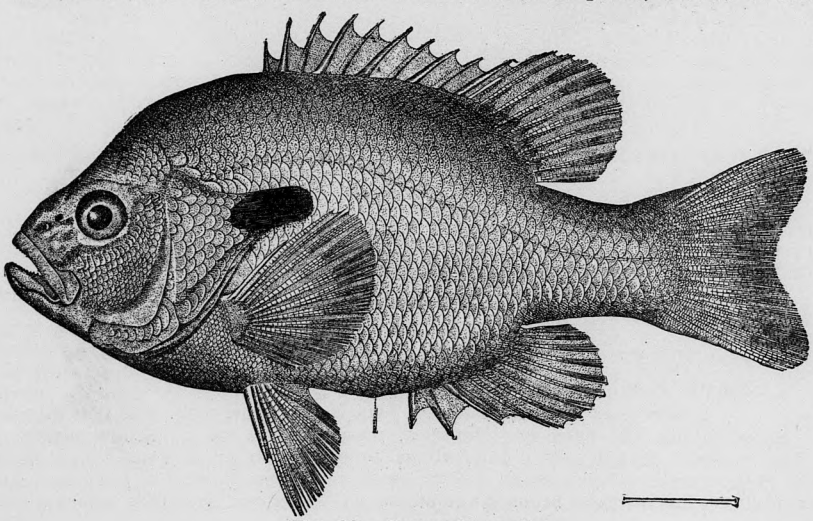


Fig. 33.—Lepomis auritus

on cheek; scales on breast very small. Body elongate, not much elevated. Snout moderately prominent. Mouth rather large, oblique, the maxillary reaching past front of eye. Palatine teeth few, rather large. Gill rakers quite short x + 8 or 9, not much longer than in *Lepomis megalotis*, but stiff and rough, set wide apart, diminishing in size from the angle forward. Opercular flap very long, narrow, usually not wider than the eye. Dorsal spines rather low, the longest 3 in head. Color olive; belly largely orange red; scales on the sides with reddish spots on a bluish ground; head usually with bluish stripes; fins becoming dusky in spirits. Length 8 inches. Maine to Louisiana; abundant in all streams east of the Alleghenies.

Maryland localities: Cecil, Carroll, Harford, Montgomery and Somerset counties.

COMMON SUN-FISH; BREAM; POND-FISH; PUMPKIN-SEED; SUNNY

Lepomis gibbosus, (Linn.)

Perca gibbosa, Linnæus, Syst. Nat., ed. X, 1758, 292, Carolina; after *Perca fluviatilis gibbosa ventre lutea* of Catesby.

Eye large, the maxillary reaching its front; cheeks with four rows of scales; spines moderate; pectoral scarcely longer than head; opercular spot moderate. Greenish olive, the sides bluish, the belly and lower fins orange; the sides profusely mottled with orange; D. bluish, orange spotted. Head 3¼; depth 2. D. X, 11; A. III, 10. Scales 7-47-13. L. 8. Minn. and Great Lakes to Maine, and S. to S. C.; exceedingly abundant N and E., but in Western rivers rarely coming south of the latitude of Chicago. A familiar and

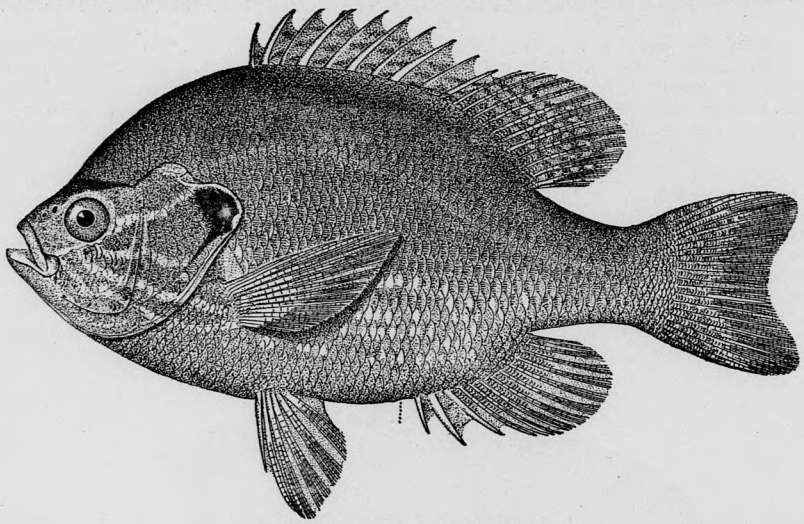


Fig. 34.—Lepomis gibbosus

active inhabitant of clear brooks, defending its nests with great spirit. "A very beautiful and compact fish, perfect in all its parts, looking like a brilliant coin fresh from the mint."

Maryland localities: Anne Arundel, Caroline, Carroll, Cecil, Harford, Montgomery, Prince Georges, Somerset, St. Mary's and Worcester counties.

GREEN SUN-FISH

Lepomis cyannellus, (Rafinesque)

Lepomis cyannellus, Rafinesque, Jour. de Physique, 1819, 420, Ohio River.

Body oblong, the back not elevated; mouth large, the maxillary nearly to middle of eye; dorsal spines low, about equal to snout; opercular flap short, with pale margin. Green, with brassy lustre, each scale with a blue spot and gilt edging; fins largely blue. Anal edged with orange; iris red; cheeks with

blue stripes. Head 3; depth 2½. D. X, 11; A. III, 9. Lat. 1.48; L. 7. Great Lakes to Georgia and Mexico; very abundant in small brooks, especially south; very variable

Maryland localities: Counties of the Atlantic drainage.

CRAPPIE; BACHELOR; NEW LIGHT; CAMPBELLITE; SAC-A-LAIT; CRAPET

Pomoxis annularis, (Rafinesque)

Pomoxis annularis, Rafinesque, Amer. Month. Mag., 1818, 41, Falls of the Ohio River.

Body elongated. D. VI, 15; A. VI, 18; scales 36 to 48. Head long, the profile more or less strongly S-shaped, owing to the projecting snout, depressed occipital region, and very prominent thickened antedorsal area. Mouth very wide. Scales on cheeks in four or five rows. Color silvery olive, mottled with dark green, the dark marks chiefly on the upper part of the body and having a tendency to form narrow vertical bars; dorsal and caudal fins marked with

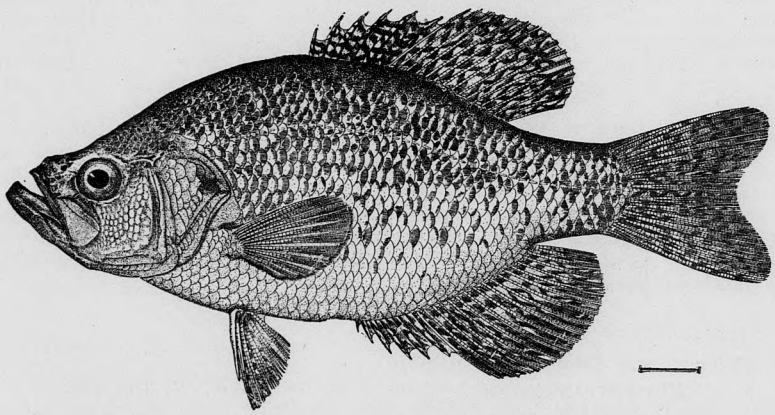


Fig. 35.—Pomoxis annularis

green; anal fin pale, nearly plain. Fins very high, but lower than in *Pomoxis sparoides*. Length 12 inches. Very variable. Middle United States from the Great Lakes south to Texas and west to Kansas and Nebraska; generally common, especially in sluggish waters, in ponds and bayous; it strongly resembles its equally abundant congener, but the two do not intergrade so far as we have seen.

Maryland localities: Harford, Montgomery and Prince George counties.

CALICO BASS; GRASS BASS; BARFISH; STRAWBERRY BASS

Pomoxis sparoides, (Lacépède)

Labrus sparoides, Lacépède, Hist. Nat. Poiss., XIII, 517, 1802, South Carolina.

D. VII or VIII, 15; A. VI, 17 or 18; scales 40 to 45, 6 rows on cheek. Body oblong, elevated, much compressed. Head 3; depth 2. Head long, its profile not strongly S-shaped, the projection of the snout and antedorsal region and the depression over the eye being less marked than in *Pomoxis annularis*. Mouth smaller than in *P. annularis*, the maxillary reaching about to the posterior edge of pupil, the mandible shorter than pectorals. Fins very high; anal higher than dorsal, its height 4 to 5 times in length of body. Color silvery olive, mottled with clear olive green, the dark mottlings gathered in irregular small bunches, and covering the whole body; vertical fins with dark olive reticulations surrounding pale spots; the anal marked like the dorsal; a dusky

opercular spot. Length 12 inches. Great Lakes and upper Mississippi Valley to New Jersey, and southward to Florida, Louisiana, and Texas; chiefly in

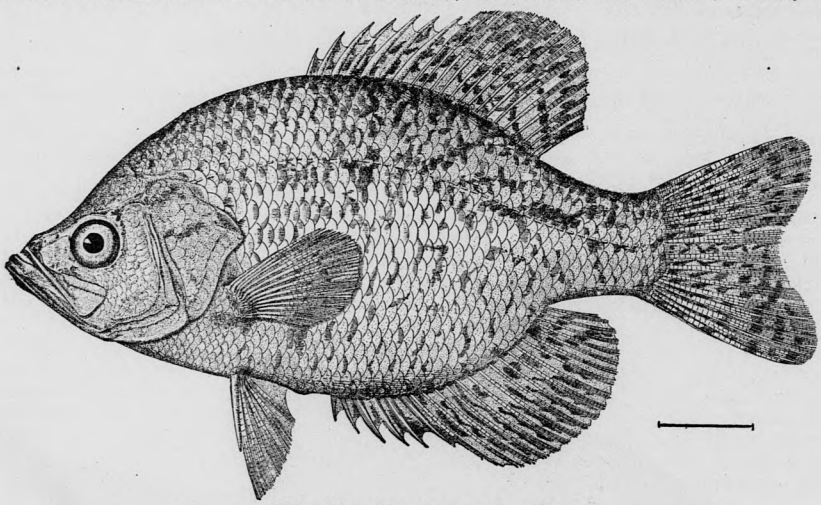


Fig. 36.—Pomoxys sparoides

lowland streams and lakes, abundant; a handsome fish, valued as food; it frequents chiefly cold and clear waters, being rarely seen in muddy bayous.

Maryland localities: Cecil (Port Deposit), Harford (Havre de Grace), Kent (Chester River), and Montgomery counties.

Small-mouth Black Bass

Micropterus dolomieu, (Lacépède)

Micropterus dolomieu, Lacépède, Hist. Nat. Poiss., IV, 325, 1802.

The small mouthed bass differs most markedly from the large mouthed in the size of its jaws, the shallower notch in the dorsal fin and the smaller scales. There are about 11 rows of scales above the lateral line and seven below it; 72-74 scales in the lateral line. The ninth spine of the dorsal is longer than

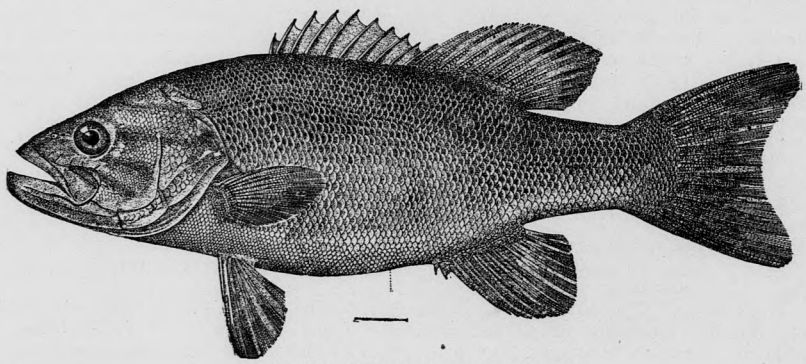


Fig. 37.—Micropterus dolomieu

the eye and fully two-thirds as long as the fifth and longest spine. The upper jaw extends backward to below the hind margin of the eye. The body is ovate oblong in shape, its greatest depth about equal to length of the head and one-third of the total without caudal, becoming deeper with age. The eye is

less than two-thirds as long as the snout and about one-sixth the length of head. The pectoral is not much longer than the ventral and slightly more than one-half the length of head. The soft dorsal and anal are more scaly at the base than in the large-mouthed species. The scales on the cheeks and breast are very much smaller than those on the middle of the sides. D. X, 13-15; A, III, 10.

The young are dull yellowish-green, the sides mottled with darker spots, which sometimes form short vertical bars. Three dark stripes on the head; caudal yellowish at the base; a broad black band near middle of tail and a broad whitish margin behind. The dark lateral band characteristic of the large-mouthed species is not found in the small-mouth. In the adult the prevailing color is olive green, the stripes on the head remaining more or less distinct.

One of the early names for the small-mouthed black bass is that of growler, which appears in the writings of Cuvier, who was under the impression that the name was applied because of a noise sometimes produced by this bass. At the time of his writing the name growler was pretty generally identified with the black bass. Among the names applied to this fish by Rafinesque are lake bass, big bass, spotted bass and achigan. He also mentions it under the names painted tail, bridge perch, yellow bass, gold bass, brown bass, minny bass, little bass, hog bass, yellow perch, black perch, trout perch, streaked head, white trout and brown trout. In the southern states the small-mouth is known as the trout, perch and jumper. In Alabama it is called mountain trout. Some persons style it the bronze backer. The most appropriate name and the one by which it is best known is that of black bass or small-mouthed black bass.

This species is idigenous to the upper parts of the St. Lawrence basin, the Great Lakes region and the basin of the Mississippi. East of the Alleghenies it is native to the headwaters of the Ocmulgee and Chattahoochee rivers, but north of these streams, though not originally an inhabitant of the waters, it has been widely distributed by artificial introduction.

Maryland localities: Introduced rather generally in western Maryland, Kent county.

Large-mouth Black Bass

Micropterus salmoides, (Lacépède)

Labrus salmoides, Lacépède, Hist. Nat. Poiss., IV, 716, 1802, South Carolina.

The large-mouthed black bass takes its common name from the size of its jaws; the lower jaw projects very strongly, and the maxilla in the adult extends beyond the hind margin of the eye. The depth of the body is about one-third of the total without caudal, and does not equal the length of the head. The eye is shorter than the snout, about one-sixth of the length of the head. The pectoral is half as long as the head, much longer than the ventral. The spinous dorsal is very low, its ninth and tenth spines not so long as the eye, its fourth spine longest, about one-fourth the length of head. Seven to eight scales above the lateral line, below 16 and in the lateral line about 68. The color is greenish, silvery below. The young have a broad dark lateral band. D. X, 13; A. III, 10-11.

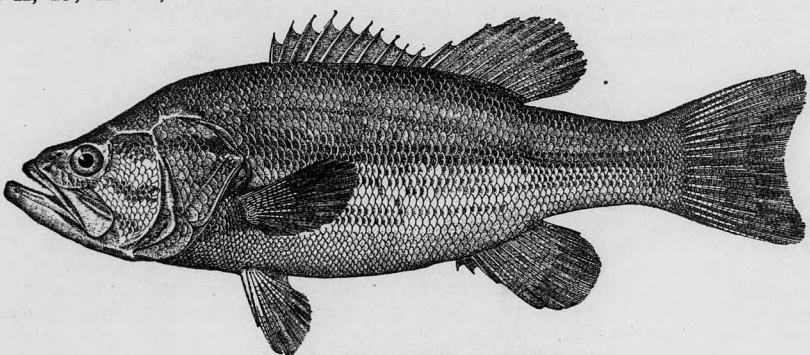


Fig. 38.—Micropterus salmoides

This species is indigenous to the upper parts of the St. Lawrence basin, and is best distinguished by the size of its mouth and the number of rows of scales above the lateral line. The young of the small-mouthed species, also, never have a dark lateral band.

Common names for this species are, Oswego bass, river bass, green bass, moss bass, bayou bass, trout, jumper, chub and Welshman. Throughout the north it is generally known as bass, in Virginia and North Carolina as chub and in Florida and west to Texas as trout.

The large-mouthed bass has a wide distribution, being indigenous to the eastern United States, from Manitoba to Florida and Texas, except New England and the Middle Atlantic states east of the Allegenies, where it has been extensively introduced. It inhabits the fresh-water ponds, lakes and sluggish streams. It is also found at the mouths of rivers emptying into the Gulf of Mexico, where the water is brackish.

Maryland localities: Introduced generally in Maryland.

ROCK BASS; RED EYE; GOGGLE EYE

Ambloplites rupestris, (Rafinesque)

Bodianus rupestris, Rafinesque, Amer. Month. Mag., 1817, 120, Lakes of New York, Vermont and Canada.

Body oblong; eye very large. Olive green, sides brassy, much mottled with dark green; young with blackish bars; adults with rows of dark spots

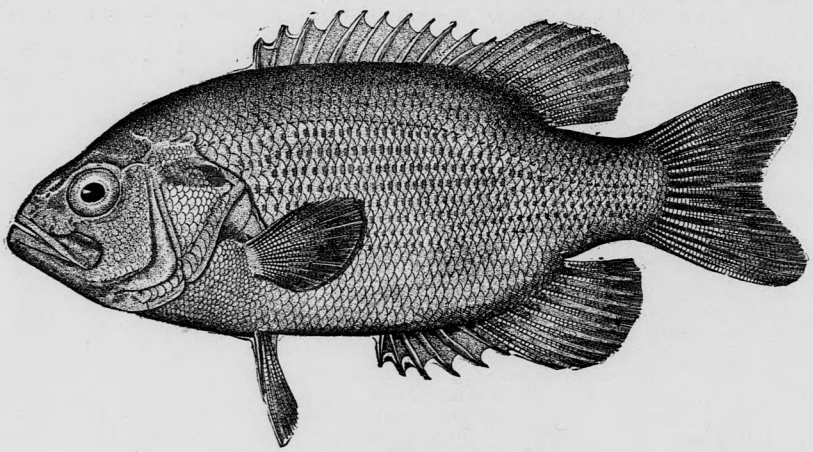


Fig. 39.—Ambloplites rupestris

along sides; iris red. Head 2¾; depth 2. D. XI, 10; A. VI, 10. Scales 5-40-12. L. 12. Vermont to Manitoba, S. to La. and N. C., common West.

Maryland localities: Montgomery and Prince George counties

WAR-MOUTH; RED-EYED BREAM

Chaenobryttus gulosus, (Cuvier)

Pomotis gulosus, Cuvier, Hist. Nat. Poiss., III, 498, 1829, Lake Pontchartrain and lagoons about New Orleans.

Body oblong, robust; eye moderate. Olive green, sides brassy with blotches of bluish, greenish, and copper-red; cheeks with three or four dark bands; fins dusky, mottled; a dark spot on last D. rays; young barred; some specimens with rows of dark spots on sides. Head 2⅔; depth 2⅛. D. X, 10; A. III, 9. Scales 6-40-12. L. 10. Lake Michigan to Virginia and Texas, abundant S. in sluggish waters. Northern specimens are deeply covered, the adult with blue and coppered-red; the D. is usually a trifle farther forward, over opercular spot; this is var. *antistius* McKay.

Maryland localities: Washington county.

PIKE PERCH; WALL-EYED PIKE; DORY; GLASSEYE; YELLOW PIKE; BLUE PIKE; JACK SALMON; WHITE EYE

Stizostedion vitreum, (Mitchill)

Perca vitrea, Mitchill, Supp. Amer. Month. Mag., II, 247, 1818, Cayuga Lake, New York.

Head 3⅔; depth about 4½; eye shorter than snout, 4½ to 5 in head. D. XII to XVI, 19 to 21; A. II, 12 to 14; scales 10-110 to 132-25, 83 to 95 pores. Body slender, becoming compressed with age, the back more arched than in *Stizostedion canadense*. Cheeks and upper surface of head nearly naked. Dorsal spines high, more than half length of head; dorsal fins well separated, the interspace between them greater than diameter of eye, the last dorsal spine scarcely erectile; soft dorsal nearly as long as spinous dorsal; anal longer than high. Dark olive, finely mottled with brassy; sides of head more or less vermiculated. Spinous dorsal with a large jet-black blotch on the membrane of the last two or three spines, otherwise nearly plain. Great Lake region, Upper Mississippi,

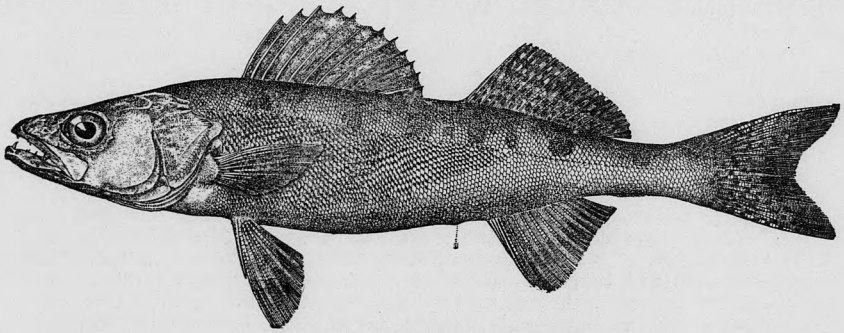


Fig. 40.—Stizostedion vitreum

north to Assiniboia, east to Vermont and Pennsylvania, south to Georgia and Alabama, especially common northward; an abundant and valued food-fish, reaching a length of three feet and a weight of ten to twenty pounds.

Maryland localities: Susquehanna River.

YELLOW PERCH; AMERICAN PERCH; RINGED PERCH; RACCOON PERCH

Perca flavescens, (Mitchill)

Morone flavescens, Mitchill, Rept. Fish, N. Y., 18, 1814, near New York City.

Head 3¼; depth 3¼. D. XIII to XV-II, 13 to 15; A. II, 7 or 8; scales 7-74 to 88-17, 54 to 62 with pores. Back highest at origin of spinous dorsal,

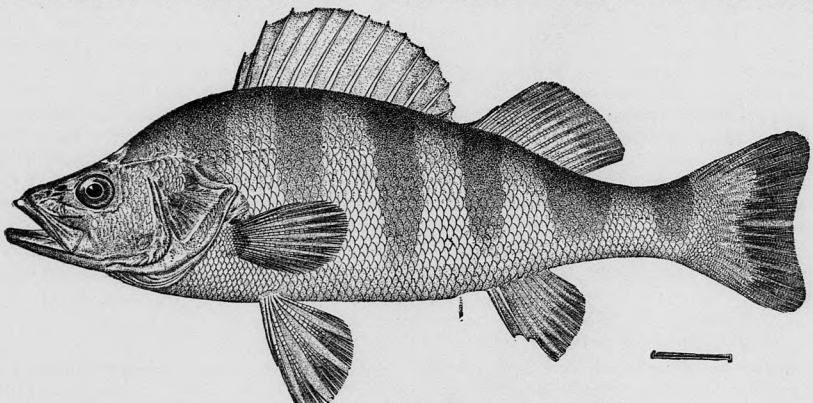


Fig. 41.—Perca flavescens

which is more or less behind insertion of pectoral; profile convex from dorsal to occiput, thence concave anteriorly, the snout projecting, a little longer than eye. Mouth somewhat oblique, maxillary not quite reaching opposite middle of orbit. Gill rakers x + 15, the longest ⅓ to ¾ length of branchial filaments. Cheeks closely scaled throughout, the scales imbricated; opercular striæ and rugosities on top of head well marked. First anal spine longer than first dorsal spine; first dorsal spine inserted above or a little behind base of pectoral. Pseudobranchiæ quite small. Gill rakers stout, shortish. Back dark olivaceous; sides golden yellow; belly pale; sides with six or eight broad, dark bars, which extend from the back to below the axis of the body; lower fins largely red or orange; upper fins olivaceous; with or wihout a distinct black spot on anterior or posterior part of spinous dorsal. Length one foot. Fresh waters of the eastern United States, chiefly northward and eastward; abundant in the Great Lakes and in coastwise streams from Nova Scotia to North Carolina, common in the tributaries of the upper Mississippi, especially in Iowa and Minnesota west to the Dakotas; unknown from central Ohio southwest; abundant in the lakes of northern Indiana; not known from the Ohio River or the lower Missouri. A familiar handsome and active fish of fair quality as food, the flesh not rich in flavor.

Maryland localities: Anne Arundel (Severn River), Baltimore (Baltimore Harbor), Calvert, Caroline, Cecil, Harford (Gunpowder River), Kent, Montgomery, Talbot, Worcester and Wicomico (Salisbury) counties. Abundant in the Potomac River and its tributaries, where it is known as "Yellow Ned."

LOG PERCH; ROCKFISH; HOG-MOLLY; HOGFISH

Percina caprodes, (Rafinesque)

Sciæna caprodes, Rafinesque, Amer. Month. Mag., 1818, 534, Ohio River.

Head 4 to 4¾; depth 5 to 6½; eye 1½ in snout, 4 in head. D. XIII to XVII-12 to 17; A. II, 9 to 12; scales 9-90 to 95-15, pores 76 to 93. Body elongate, compressed. Head long and pointed, depressed and sloping above. Mouth small, quite inferior, the maxillary not reaching to the front of the eye. Cheeks, opercles and nape scaly. Chest naked. Fins rather low. Middle line of belly with a row of enlarged caducous scales; pectoral about as long as head; anal spines feeble, subequal, or the second the longer; caudal truncate; vertebræ 23 + 21 = 44. Color yellowish green, or yellow with about 15 transverse dark bands from the back to the belly, these usually alternating with

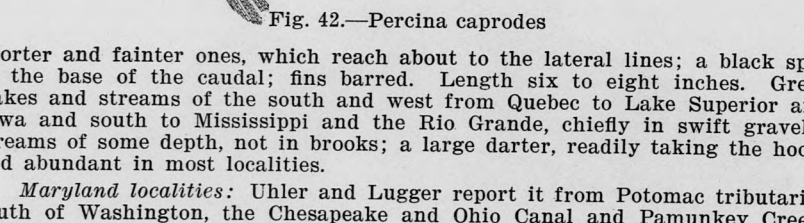


Fig. 42.—Percina caprodes

shorter and fainter ones, which reach about to the lateral lines; a black spot at the base of the caudal; fins barred. Length six to eight inches. Great Lakes and streams of the south and west from Quebec to Lake Superior and Iowa and south to Mississippi and the Rio Grande, chiefly in swift gravelly streams of some depth, not in brooks; a large darter, readily taking the hook, and abundant in most localities.

Maryland localities: Uhler and Lugger report it from Potomac tributaries south of Washington, the Chesapeake and Ohio Canal and Pamunkey Creek, D. C.

SHIELDED DARTER

Hadropterus peltatus, (Cope)

Etheostoma peltatum, Stauffer, in Cope, Proc., Acad. Nat. Sci. Phila., 1864, 233, Conestoga Creek, near Lancaster, Pa.

Head 4; depth 5⅔; eye 4. D. XIII-12; A. II, 10; scales 6-52 to 56-9. General form of *Hadropterus aspro*, but stouter and with larger scales; head rather heavy,

the snout bluntish in profile, about as long as eye; lower jaw slightly included, maxillary reaching just past front of eye, its length 3 2/5 in head; gill membranes scarcely connected. Cheek usually wholly naked *(peltatus)*, but often with smooth embedded scales *(nevisensis)*. Opercle with about three small scales above, sometimes naked on one side; nape and breast naked; caducous ventral shields large and few in number. Fins all comparatively low and small; pectoral a little shorter than head, barely reaching tips of ventrals; anal nearly as large as second dorsal, its second spine a little slenderer and longer than first; caudal lunate. Light straw color, the marking all very dark, verging on jet black; back with dark cross blotches and irregular wavy longitudinal markings above lateral line; sides with six large conspicuous square black blotches, about as broad as the interspaces and alternating with fainter bars of black, these sometimes coalescing in a dark lateral bar; a faint dusky streak along lateral line, markings sometimes bright, or obscure or diffuse. Southeastern Pennsylvania southward to South Carolina in coastwise streams; locally common; not found west of the Alleghenies.

Maryland localities: Anne Arundel, Harford and Prince Georges counties.

TESSELLATED DARTER

Boleosoma longimanus, (Jordan)

Etheostoma longimana, Jordan, Proc. Acad. Nat. Sci. Phila., 1888, 179, tributary of James River, Va.

The body of this darter is moderately long and little compressed. Head long, blunt in front, above the eyes convex. Profile of snout steep, nearly straight; premaxillaries protractile maxillaries to eye or snout, one-fourth length of head. Teeth rather strong. Lateral line complete, scales rather large, breast and cheeks naked. The long pectorals reach front of anal and are about one and one-half times length of head. Ventrals long; dorsal spines high; soft dorsal very high; anal smaller than soft dorsal, its spine short, the first ray longer, simple, articulated toward the tip; caudal lunate. Color straw yellow, with many of the scales on the back darker. Ten dark spots rather irregular and small on each side; one at base of caudal and one on front of opercle; back with five or six cross blotches; both dorsals with dark spots. Caudal and pectoral faintly barred, three or four dark bars on caudal; ventrals and anal plain. A narrow stripe forward from eye, with a faint dark shade below eye. Black spot on base of pectoral minute. In life, this darter is clear green, with marking of darker green or black. Length 2½ inches. The type locality is tributary to James River, Va.

Maryland localities: Prince Georges County.

JOHNNY DARTER

Boleosoma nigrum effulgens, (Girard)

Arlina effulgens, Girard, Proc. Acad. Nat. Sci. Phila., 1859, 64 brooks and streams flowing into the Potomac River.

Head 4 1/5; depth 6¼; eye 3¾ in head. D. IX-13; A. I, 9. Scales 5-40 to 49-6. Body rather slender; caudal peduncle not contracted; opercular spines rudimental; muzzle abruptly decurved. Opercles scaly, cheeks, nape and breast naked; sometimes a few scales on cheek. Fins very high; caudal very much rounded; vetrals reaching anal; pectorals still longer. In the male the dorsal is extremely high, the membranes largely black, the rays spotted with white; seven dark cross blotches on back; eight faint dark marks on side, the intervening spaces metallic green in life; a small spot at base of caudal; caudal with white specks. Length 2½ inches. Maryland to North Carolina.

Maryland localities: Montgomery and Prince Georges counties. Described from brooks and streams flowing into the Potomac as *Arlina effulgens*, Girard.

OLMSTED'S DARTER; GRAND ORANCHEE

Boleosoma nigrum olmstedi, (Storer)

Etheostoma olmstedi, Storer, Jour. Bost. Soc. Nat. Hist., 1841, 61, pl. 5, fig. 2, Hartford, Connecticut.

Head 4; depth 5½. D. IX-14 or 15; A. I, 9; scales 47 to 52. Body slender, little compressed, with long caudal peduncle. Head slender, rather pointed. Cheeks and opercles scaly; space before dorsal and breast usually naked, some-

times closely scaled. Fins very high, pectorals reaching past tips of ventrals. Coloration olivaceous, tessellate above; sides with blotches and zigzag markings; fins speckled or somewhat barred; head not speckled, dusky in males; usually a black stripe forward from the eye and another downward. Length 3½ inches. Lake Ontario to Massachusetts, south to Virginia, chiefly coastwise and east of the Alleghenies; probably intergrades with *Boleosoma nigrum*,

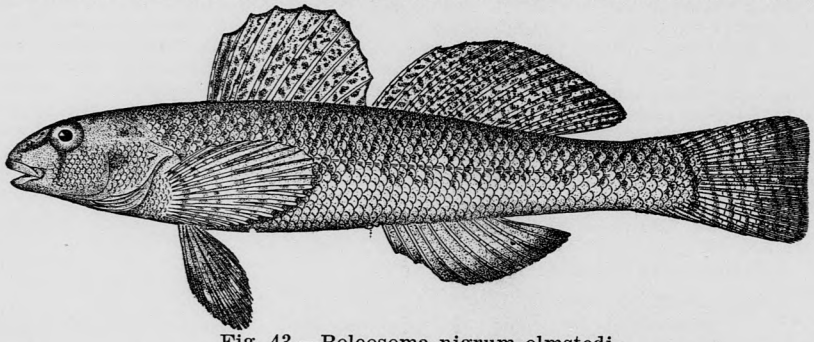


Fig. 43.—Boleosoma nigrum olmstedi

but generally the dorsal is longer in *olmstedi*, the fin higher and the head more scaly.

Maryland localities: Caroline, Cecil, Harford, Montgomery, and Prince Georges counties.

FAN-TAILED DARTER

Etheostoma flabellare, (Rafinesque)

Etheostoma flabellaris, Rafinesque, Jour. de Phys., 1819, 419, tributaries of Ohio River.

Head 3⅗ to 4; depth 4½ to 5½; eye 4 to 5½; eye 4 to 4½ in head; snout 4. D. VIII-12 to 14; A. II, 7 to 9; scales 9-40 to 65-14, 15 to 40 pores. Body slender; head long and pointed, snout not decurved; mouth very oblique, lower jaw projecting; maxillary reaching front of eye. Fins all low, the first dorsal in the male about ⅓ as high as second, higher in the female; anal about size of soft dorsal; pectorals usually not quite as long as head; caudal large, rounded. Scales moderate; head entirely naked; lateral line nearly straight, incomplete, reaching about to end of first dorsal. Color rather dark, body covered with numerous fine dark specks, these forming cross bands or blotches in the males, less distinct in the females. Lenght 2½ inches. New York to Virginia, west to Iowa and south to South Carolina, and northern Alabama, usually abundant wherever found. It lives in swift waters and its movements in the water are more active than those of any other species; it is the most hardy in the aquarium.

Maryland localities: Carroll, Montgomery and Prince George's counties.

Family **Serranidæ**

STRIPED BASS; ROCKFISH; ROCK

Roccus lineatus, (Bloch)

Sciaena lineata, Bloch, Ichth., IX, 53, pl. 305, 1792, "Mediterranean."

Head 3¼ to 3½; depth 3½ to 4, varying considerably with age, the young being more slender. D. IX-I, 12; A. III, II; scales 8-67-11. Body rather elongate; little compressed, the depth less than ⅓ the length; back little arched; head subconical; mouth large, the maxillary reaching to nearly below the middle of orbit, 2½ in head, its width at tip nearly ⅔ diameter of eye; teeth on base of tongue in two parallel patches; interorbital space wide; lower jaw projecting; eye ½ to ⅔ the length of the rather sharp snout, 5 to 7 in head; preorbital entire; preopercle rather weakly serrate, the teeth strongest at the angle; margin of subopercle entire. Gill rakers long and slender, about 4 + 15; dorsal fins entirely separated; spines slenderer than in allied species; longest dorsal spine 2⅓ in head; anal spines graduated; second anal spine 5 to 6 in head; caudal forked, the middle rays ⅗ the length of outer. Color olivaceous,

silvery, often brassy tinged; sides paler, marked with 7 or 8 continuous or interrupted blackish stripes, one of them along the lateral line; fins pale. Atlantic coast of the United States, from New Brunswick to the Escambia River, Florida, ascending all rivers in spring for the purpose of spawning; rather rare in the Gulf of Mexico; most common from Cape Cod to Cape May; occasionally in Lake Ontario. Introduced by the U. S. Fish Commission into Sacramento River and elsewhere on the west coast, where it has become an abundant and valuable food-fish. This species is one of the most important of the game and food fishes of America. It is very abundant throughout its range and reaches a large size, often weighing 30 to 90 pounds. The largest one ever reported, according to Goode was taken at Orleans, Massachusetts, and weighed 112 pounds. Its flesh is firm, white, flaky and of excellent flavor.

Maryland localities: Anne Arundel, Baltimore, Worcester, Cecil, Calvert, Dorchester, Harford, Kent, Montgomery, St. Mary's and Talbot counties.

WHITE PERCH

Morone americana, (Gmelin)

Perca americana, Gmelin, Syst. Nat., Linn., 1308, 1788, New York, after Schöpf.

Head 2¾ to 2; depth 2½ to 3. D. IX-I, 12; A. III, 8 or 9; scales 8-50 to 55-12, 50 to 55 pores. Body oblong, ovate, the back moderately elevated; head depressed above eyes; the snout rather pointed; mouth small, somewhat oblique, the maxillary not reaching the middle of orbit, 2 4/5 in head, its width at tip half eye; preorbital entire; eye moderate, scarcely as long as snout, four in head; base of tongue without teeth; head scaled to between the nostrils; gill rakers 4 + 14 to 17, rather long, as long as gill fringes. Dorsal and anal spines moderate, the longest dorsal spine 2 in head; the second anal spine 2½ to 3, as long as third spine; dorsal fins considerably connected; pectorals 1⅓ to 1¼ in head. Color olivaceous, varying to dark green; sides silvery or olivaceous, usually with faint, paler streaks. Length 8 to 14 inches. Atlantic Coast of

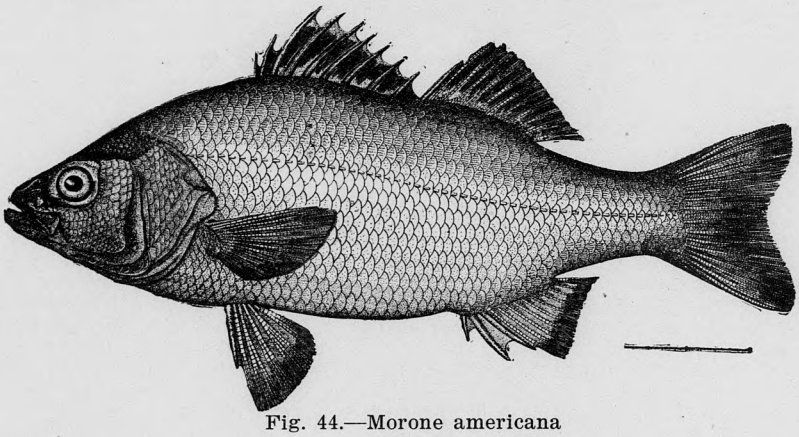


Fig. 44.—Morone americana

the United States from Nova Scotia to South Carolina, ascending streams and frequently landlocked in ponds, the pond specimens much darker in color; one of the most abundant and characteristic fishes of the brackish waters and river mouths of our Atlantic Coast. A very excellent panfish. Specimens from Woods Hole represent the variety called *nigricans,* very dark green in color, scarcely paler below, the body deeper and the spines lower and shorter than in the common White Perch (head 3⅓ in length; depth 2¾; fourth dorsal spine 2 2/5 in head; second anal spine 3 1/5; A. III, 9); this form occurs landlocked in fresh water ponds.

Maryland localities: Anne Arundel (Annapolis and Severn River), Baltimore, Caroline, Cecil, Harford (Bush and Gunpowder Rivers), Kent (Betterton and Sassafras River), Montgomery, Prince Georges, Somerset, Talbot (Oxford), Wicomico (Salisbury) and Worcester counties.

SEA BASS; BLACK WILL

Centropristes striatus, (Linn.)

Labrus striatus, Linnæus, Syst. Nat., ed. X, 285, 1758, "America," description very brief, but not to be referred to any other fish.

Head 2⅔; depth 2⅔ to 3. D. X. 11; A. III, 7; scales 5-55 to 60-16 to 20, pores 50 to 55. Body robust, the back somewhat elevated anteriorly; head large, thick, little compressed; top of head naked; eye large, nearly 5 in head; mouth oblique, low, rather large; lower jaw projecting; maxillary broad, 2¼ in head; teeth in broad bands, the canines small, none of the teeth movable; gill rakers long, about x + 18 developed; scales on cheek in about 11 rows; posterior border of preopercle finely serrate, the angle and lower border with larger teeth, some of them turned forward; maxillary slipping anteriorly under the edge of the preorbital, which is as broad as the eye; dorsal spines rather strong, the middle ones rather higher than the posterior, which are lower than the soft rays; highest dorsal spine two in head, none of the spines filamentous, but provided with short, lateral, dermal flaps; pectorals very long, 1¼ in head; ventrals scarcely shorter; anal spines graduated; caudal slightly

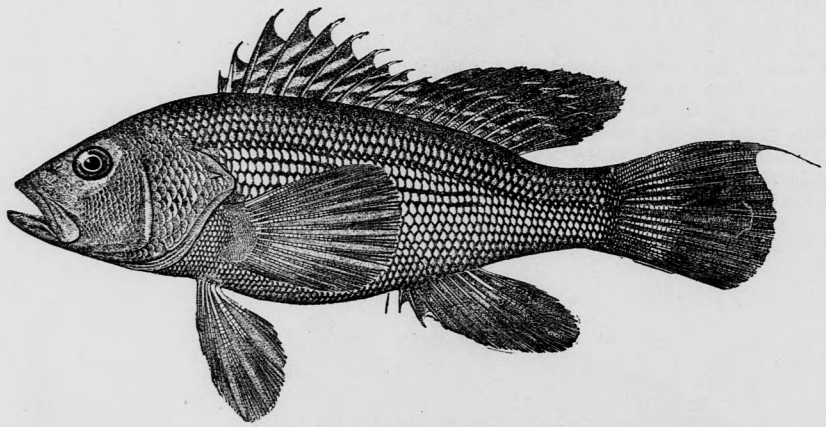


Fig. 45.—Centropristes striatus

double concave with its angles little produced, the longest ray not exserted for a distance equal to the length of the fin. Color dusky brown or black, more or less mottled and with paler longitudinal streaks along the rows of scales. Dorsal with several series of elongate whitish spots forming oblique light stripes; other fins dusky, mottled; young with a black longitudinal band, which later breaks up, forming dark cross shades, a large black spot on last dorsal spines. Sexes notably different; the fin rays longer in the male. Pyloric cocea 4 to 7. Length 18 inches. Atlantic Coast of United States, Cape Ann to northern Florida; common northward; one of the common food-fishes of our Atlantic Coast, reaching a weight of about three pounds; its flesh excellent.

Maryland localities: Calvert, Dorchester, Somerset, Wicomico, St. Mary's, and Worcester counties.

Family **Lobotidæ**

TRIPLE-TAIL

Lobotes surinamensis, (Bloch)

Holocentrus surinamensis, Bloch, Ichth., pl. 243, 1790, Surinam.

Head 3; depth 1 4/5 to 2¼. D. XII, 15; A. III, 11; scales 47. Head small. Profile from dorsal to occiput strongly convex, from occiput to snout concave; maxillary reaching beyond middle of orbit. Scales around eye very small, those on opercle large. Eye small, much shorter than snout. Preopercular strongly dentate, teeth enlarged on angle, hooked upward on posterior limb. Pectorals shorter than ventrals, which do not reach vent; soft dorsal higher than the spinous portion. Small scales running up on the base of soft dorsal, anal, and

caudal. Blackish above, becoming silvery gray on the sides; often blotched and tinged with yellow; fins dusky gray, sometimes with yellow. A large fish of rather sluggish habits, reaching a length of three feet and found in all warm seas; north on our coasts to Cape Cod and Panama; not very common; straying occasionally to the Mediterranean; used as food. Variable, the young looking quite unlike the adult.

Maryland localities: Worcester county. Lower Chesapeake Bay, according to Uhler and Lugger.

Family **Hæmulidæ**

COMMON GRUNT; RONCO RONCO; RONCO ARARA

Hæmulon plumieri, (Lacépède)

Labrus plumieri, Lacépède, Hist. Nat. Poiss., III, 480, pl. 2, fig. 2, 1802, Martinique; on a copy of drawing by Plumier, identified with this species by Cuvier.

Head 2⅔; depth 2⅔; eye small, 5 to 6 in head. D. XII, 16; A. III, 8; scales 5-50-17. Body moderately elongate, the back elevated and somewhat compressed; head long, the snout sharp and projecting, its length 2 1/5 in head; anterior profile more or less S-shaped, nearly straight from tip of snout to before eye, there concave and thence gibbous to the front of dorsal; old specimens having the nape more gibbous than young ones. Mouth very large; maxillary reaching to a little beyond front of eye, its length 1⅞ in head; lower jaw slightly included. Teeth strong, in rather broad bands, those of the outer series enlarged. Interorbital space convex, four in head; preorbital rather deep, its least breadth 6 in head; preopercle finely serrate. Gill rakers small, about 12 + 15. Scales rather large, those above lateral line anteriorly very much enlarged, arranged in irregular and very oblique series, those below also oblique.

Dorsal spines stout, the fourth longest 2 2/5 in head; longest soft rays 3¾ in head; caudal lobes subequal, 2 in head; longest anal rays 2 4/5 in head, their tips when depressed about reaching tips of the last rays; second anal spine longer and stronger than third, 2½ in head, its tip when depressed at least reaching middle of last ray; ventrals 1¾ in head; pectorals 1½. Color in life bluish-gray, the bases of the scales above bright bronze, tinged with olive; bases of scales below lateral line also bronze, this color forming very oblique stripes, running upward and backward; anterior region above lateral line with three or four sky-blue stripes, ill defined, apparently continuations of stripes of head; head golden bronze with stripes of deep clear blue. Lips dusky, inside of mouth deep orange, bordered anteriorly on the jaws by yellow; a greenish bar on opercle partly concealed by the preopercle; dorsal grayish with a narrow yellow edge on spinous portion. There is considerable variation in the depth of color in this species. The color in spirits differs only in the blue becoming dusky. West Indies; abundant from Cape Hatteras to Rio Janeiro on sandy shores; here described from Key West specimens. This species is the "Grunt" par excellent of our South Atlantic Coast. It is not rare in West Florida and on the Carolina Coast, while at Key West it is the most abundant food-fish, the amount taken during the year exceeding that of all other shore species combined. At Havana it is proportionally much less common, though still the most abundant of its genus. It does not usually exceed a foot in length, although individuals 18 inches long are sometimes taken. These large grunts have the back and nape more elevated and correspond to Cuvier's *Hæmulon arcuatum*.

Maryland localities: Worcester county. Salt waters not remote from the ocean, mouth of the Potomac, etc., according to Uhler and Lugger.

PIG FISH

Orthopristis chrysopterus, (Linn.)

Perca chrysoptera, Linnæus, Syst. Nat., ed. XII, 485, 1766, Charleston.

Head 3⅛; deph 2¾. D. XII or XIII, 16; A. III, 12 or 13; scales 10-60-19; maxillary 3⅛, eye five in head; preorbital 3⅗; pectoral 1¼; snout 2 2/5; highest dorsal spine 2⅞; second anal spine 5½; longest anal ray 3; base soft dorsal 1¼ in spinous. Body ovate-elliptical, somewhat elevated at shoulders, considerably compressed. Snout long and sharp; jaws equal, each with a narrow band of slender teeth; maxillary not reaching to eye; gill rakers short and slender, 7 + 12. The crown, cheeks and pieces of the gill cover, covered with scales; snout in advance of the nostrils, suborbitals and lower jaw naked.

Color in life light blue above, shading gradually into silvery below; preorbital and snout of a clear sky-blue; a dash of blue on each side of upper lip; each scale on body with a blue center, the edge with a bronze spot, these forming on back and sides very distinct orange brown stripes along the rows of scales, those above the lateral line extending obliquely upward and backward, those below being nearly horizontal; snout with bronze spots. A specimen five years in alcohol shows the following coloration: Silver-gray, with faint streaks along the rows of scales; a distinct narrow dusky band from front of spinous dorsal with a faint medium pale shade; soft dorsal with three rows of faint spots; other fins nearly plain. Length 12 to 15 inches. South Atlantic and Gulf coasts of the United States; a common and valued food-fish, abundant along the sandy shores of the eastern United States from Long Island to the mouth of the Rio Grande.

Maryland localities: Chesapeake Bay and Worcester county.

Family **Sparidæ**

COMMON SCUP; PORGY; SCUPPAUG

Stenotomus chrysops, (Linnæus)

Sparus chrysops, Linnæus, Syst. Nat., ed. XII, 471, 1766, Charleston.

Head 3½; depth 2 1/10; D. XII, 12; A. III, 11; scales 8-50-16; snout short, 2½ in head; eye small, narrower than the preorbital, 4 to 4½ in head; fourth dorsal spine 2; third anal spine the longest, three. Body ovate-elliptical, the depth about the same from the first dorsal spine to the eleventh; anterior profile steep, nape convex, a strong depression above and in front of eye, straightish over snout; pectoral less than head, about 3½ in body, extending to first anal spine; a scaly sheath very conspicuous at base of soft dorsal and anal fins; temporal crest obsolete; supraoccipital crest continuous with the frontal bones; incisor teeth very narrow, almost conical in appearance; molars in two rows above; gill rakers small, about 6 + 10; top of head, snout, orbitals and chin naked; scales on cheek extending from upper margin of eye, the anterior row composed of from 15 to 20 scales; caudal fin forked, the middle ray about 2⅓ in longest ray. Color brownish, somewhat silvery below, everywhere with bright reflections but without distinct markings in the adult; soft parts of vertical fins mottled with dark in adult; young faintly barred; axil dusky. Length about a foot. Atlantic Coast of the United States from Cape Cod to South Carolina; one of the commonest food fishes of our Atlantic Coast; abundant northward.

Maryland localities: Southern Chesapeake Bay.

FAIR MAID; PINFISH; BREAM; SAILOR'S CHOICE; CHOPA SPINA

Lagodon rhomboides, (Linnæus)

Sparus rhomboides, Linnæus, Syst. Nat., ed. XII, 470, 1766, Charleston, S. C.

Head 3 1/5; depth 2 to 2⅔; eye 4. D. XII, 11; A. III, 11; scales 10-65 to 70-17. Body elongate elliptical; head flattened, muzzle pointed, profile not very

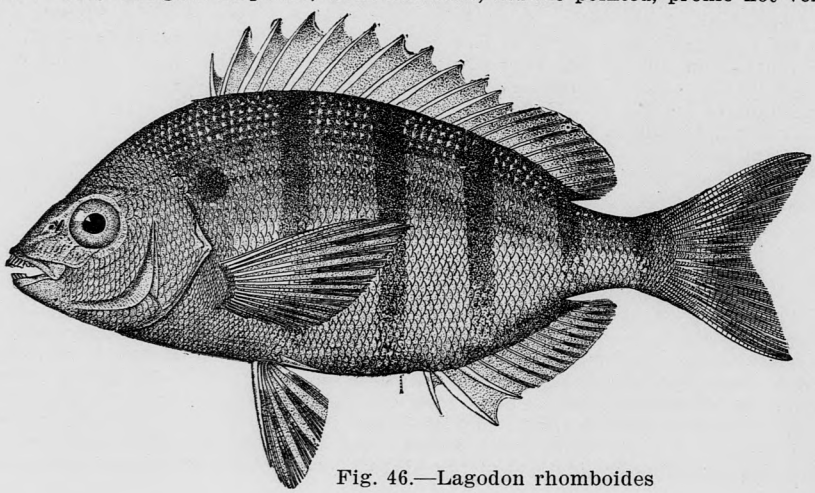


Fig. 46.—Lagodon rhomboides

steep; eye moderate; 1⅓ to 1½ in snout, 1 in interorbital; mouth moderate, maxillary not reaching front of orbit, 3⅓ in head; incisors 4/4, all deeply notched; molars in two series in each jaw; gill rakers 6 + 13; dorsal spines all rather high, the highest about two in head; caudal deeply forked; second anal spine not longer than third; ventrals short and broad, pectorals moderate, upper rays reaching past origin of anal. Color in life olivaceous, the sides bluish silvery; a humeral spot and traces of six vertical bars; gilt stripes much less intense than in *Archosargus unimaculatus*, much broader than the interspaces; about seven stripes below the lateral line, those above it more or less confluent; dorsal fin pale bluish, with a submedian gilt band, and a gilt edging; caudal yellow, faintly barred; anal bluish, with a median yellowish band; venrals medially yellowish; pectorals plain. Length six inches. Atlantic and Gulf coasts of the United States, Cape Cod to Cuba; excessively common all along the eastern coast of the United States south of New York, and on the Gulf Coast as far west as Pensacola; too small to be much used as food.

Maryland localities: Worcester county. Lower Chesapeake Bay, according to Uhler and Lugger.

SHEEPSHEAD; SARGO RAIADO

Archosargus probatocephalus, (Walbaum)

Sparus probatocephalus, Walbäum, Artedi Pisc., 295, 1792, N. Y., based on Schopf.

Head 3 to 3⅓; depth 2 to 2½; eye placed high, four in head, 1⅓ in interorbital, 1¼ in suborbital. D. XII, 10 or 12; A. III, 10 or 11; scales 8-48-15; mouth large, nearly horizontal; maxillary 2⅔ in head; incisors ¾, entire or slightly emarginate, serrate in the young, broad, their breadth about ½ their length; molars in three series above, in two below; those of the inner series larger, those behind the incisors very small; gill rakers about 3 + 6. Highest dorsal spine 1⅓ in head; dorsal and anal spines notably heteracanthous.

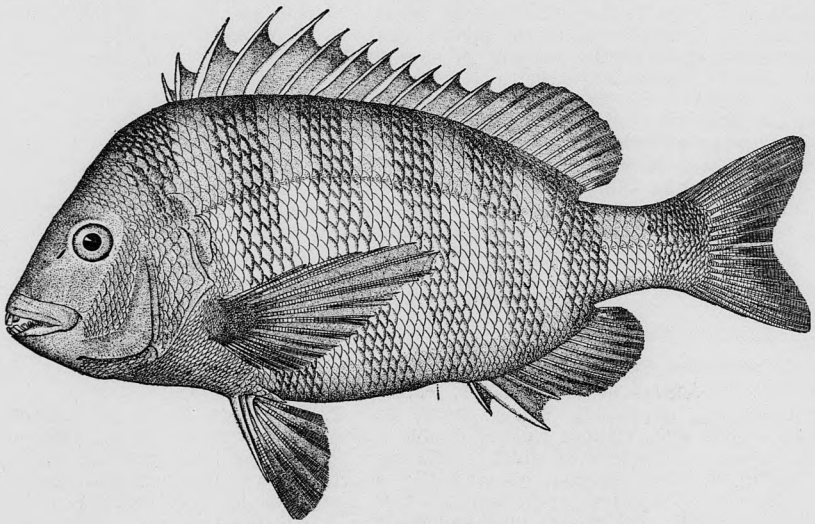


Fig. 47.—Archosargus probatocephalus

Caudal not deeply forked; second anal spine about 2 in head, much longer than the third; ventrals not nearly reaching vent; pectorals reaching past beginning of anal, slightly longer than head. Occipital crest broad, its honeycomb structure plainly exposed at its upper margin. Color grayish, with about seven broad black cross bands crossing the body, these most distinct in young; no distinct shoulder spot; spines silvery. Atlantic and Gulf coasts of the

United States; Cape Cod to Florida Keys and Texas; one of the most common and most valuable of the food-fishes of our Atlantic coast, its flesh being especially excellent in flavor.

Maryland localities: Worcester county and the Chesapeake Bay.

Family **Kyphosidæ**

BERMUDA CHUB

Kyphosus sectatrix, (Linnæus)

Perca sectatrix, Linnæus, Syst. Nat., ed. XII, 486, 1766.

Body ovate-elliptic, somewhat compressed; its greatest height 2/5 of the total length without caudal. Least depth of caudal peduncle nearly ½ length of head, the latter short, about ¼ of total without caudal. Snout short, mouth small, the maxillary reaching to below front of orbit; teeth 35 to 40 on each side, their horizontal process not much longer than the vertical; width of interorbital space 2/5 length of head. Top and sides of head finely scaled; interorbital region gibbous; preopercle serrulate; gill-rakers long. Longest dorsal spine equals snout and is nearly 1/5 depth of body; longest ray of soft dorsal 2/7 as long as the head. Caudal deeply forked, the middle rays about ½ as long as the eye; the longest anal ray is ⅓ as long as the head. Caudal deeply forked, the middle rays about ½ as long as the outer, which are nearly as long as the head. Pectoral ⅔ as long as the head, equal to ventral, which reaches to below the 9th spine of the dorsal. Soft dorsal and anal closely scaled; most of caudal scaly. D. XII, 12; A. III, II; V. I, 5; P. I, 16; scales 10-66-16. Vertebræ 9-16.

Color in life dusky, or steel gray, very slightly bluish and not much paler below. The edges of each row of scales on back and sides slightly brassy so that very faint yellowish stripes alternate with bluish ones of about equal width; the stripes thus formed vary from 25 to 35 in number. A diffuse pale stripe below the eye; a yellowish one above and below this; fins all dull grayish; ventrals and anal blackish; edge of opercle slighty darker.

The Bermuda Chub grows to the length of 18 inches. It ranges from Cape Cod to the West Indies, the Gulf of Mexico, across the ocean to the Canary Islands and is accidental in the Mediterranean. Its name of Rudder-fish refers to its habit of following vessels, presumably to secure the waste food thrown from them. The fish is said to have game qualities.

At Woods Hole, Mass., according to Dr. Smith, the species is not rare in summer and fall and has occasionally been found in April; it is sometimes taken among gulfweed at the surface. Only young specimens, up to 6 inches long, have been secured there.

The Bermuda Chub is a rare fish in Gravesend Bay, but was found there in October, 1896, and in September, 1897. It has great endurance in captivity and will survive the winter in artificially heated water.

Maryland locality: Worcester county.

Family **Sciænidæ**

BASTARD WEAKFISH

Cynoscion nothus, (Holbrook)

Otolithus nothus, Holbrook, Ichth. S. C., 134, pl. 19, fig. 1, 1860, S. C.

Head 3½; depth 3¾; eye 4; snout 4½. D. X-I, 27 to 29; A. II, 9 or 10; scales 6-58 to 62-7. Caudal weakly double concave; body rather deep; eye very large, equal to interorbital width; body more compressed than in other species, the back somewhat elevated; snout rather short, not very acute; mouth smaller than in related species; maxillary 2 1/5 in head, reaching to below posterior margin of pupil; gill rakers long and slender, 4 + 9, the longest ½ eye; lower pharyngeals very slender; dorsal fins contiguous; membrane of soft dorsal scaled to its tips; scales weakly ctenoid; lateral line much curved anteriorly, becoming straight under seventh dorsal spine. Color grayish silvery, thickly punctulate above and on sides to level of pectorals, then abruptly silvery, a row of dark points marking the line of division; snout and tip of lower jaw blackish; mouth white within; lower fins white, upper dusky. South Atlantic and Gulf coasts of United States.

Maryland localities: Reported from Chesapeake Bay by Dr. H. M. Smith.

COMMON WEAKFISH; SQUETEAGUE; SEA TROUT

Cynoscion regalis, (Schneider)

Johnius regalis, Schneider, Syst. Ichth., 75, 1801, New York.

Head 3⅓; depth 4¼; eye about 1⅓ in snout, 5 to 7 in head; snout 4 to 4⅓. D. XI, 26 to 29; A. II, 11 to 13; scales 6-56-11. Maxillary reaching to beyond pupil, 2 1/6 in head; teeth sharp, in narrow bands; canines large. Pectorals short, scarcely reaching tips of ventrals, a little more than one-half length of head; longest dorsal spine as long as maxillary, not one-half length of head; soft dorsal and anal scaly, the scales caducous. Gill rakers long and sharp, 5 + 11 in number. Color silvery, darker above and marked with many small, irregular dark blotches, some of which form undulating lines running

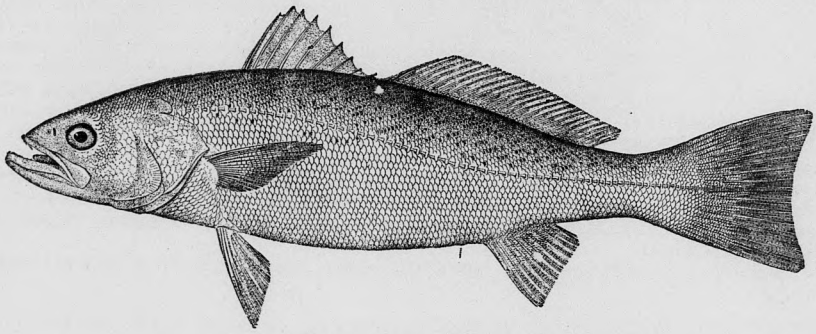


Fig. 48.—Cynoscion regalis

downward and forward; back and head with bright reflections; dorsal and caudal fins dusky; ventrals, anal, and lower edge of caudal yellowish, sometimes speckled. Atlantic and Gulf coast of the United States from Cape Cod southward to Mobile; very abundant on sandy shores, not found about rocks. It is highly valued as a food-fish, the flesh being rich and delicate. Its flesh, like that of most species of the genus, is very tender and easily torn, hence the common name Weakfish. On the Carolina coast it has received the very inappropriate name "Sea Trout." The bluefish is especially destructive to individuals of this species, the two inhabitating the same waters and often taken together.

Maryland localities: Chesapeake Bay and its tidewater tributaries and the salt waters of Worcester county.

SPOTTED WEAKFISH; SPOTTED SEA TROUT

Cynoscion nebulosus, (Valenciennes)

Otolithus nebulosus, Valenciennes, Hist. Nat. Poiss., V, 79, 1830, locality unknown.

Head 3½; depth 4½; eye small 6 to 7 in head. D. X-I, 25 to 27; A. II, 10; scales 10-70 to 75-11. Body rather elongate, compressed; snout long, acute, 3¾ in head; lower pharyngeals narrow, each with 7 or 8 series of short teeth, the inner enlarged. Gill rakers short and thick, not longer than pupil, about 4 + 7 in number; maxillary reaching to posterior edge of eye; canines strong; maxillary, preorbital, and lower jaw naked; longest dorsal spine not quite ½ the length of the head; pectorals short, not reaching tips of ventrals, 2¼ in head; caudal lunate; soft rays of dorsal and anal scaleless. Bright silvery, darker above; back posteriorly with numerous round black spots as large as the pupil; both caudal and dorsal fins marked with similar, somewhat smaller spots, much as in a trout; anal dusky. South Atlantic and Gulf Coast of the United States, New York to Texas; a most excellent food-fish, everywhere common on our Southern coast; rare north of Virginia.

Maryland localities: Chesapeake Bay, throughout, and Worcester county.

CABEZON

Larimus fasciatus, Holbrook

Larimus fasciatus, Holbrook, Ichth. South Carolina, 153, pl. 22, fig. 1, 1860, Charleston.

Head 3½; depth 3; eye 4 in head. D. X-I, 24 to 26; A. II, 5 or 6; scales 5-49-9 to 11. Body heavy forward, much compressed, the back somewhat elevated; profile convex; snout very short and blunt, 5½ in head; eye about equal to flattish interorbital area; mouth large, less oblique than in other species; tip of premaxillary on level of middle of pupil; maxillary 2 in head, reaching to below posterior third of eye; lower mandible with a slight knob at its symphysis, a small pore on each side of it; teeth minute, firm, in a single series in each jaw; pharyngeal teeth all long and slender; the pharyngeal bones small and narrow, subtriangular; gill rakers extremely elongate, as long as eye, 12 + 24; preopercle with minute cilia; third and fourth dorsal spines about 2¼ in head; second anal spine short, ¼ shorter than the first anal ray, its tip scarcely reaching end of last ray when spine is depressed, three in head; scales large, ctenoid; anal and soft dorsal with a scaly sheath at base. Color in life, grayish olive above, with some silvery; below, clear silver white; back with seven to nine rather conspicuous darker vertical bars extending to below middle of sides; fins dusky olive; anal fin and lower rays of caudal yellow; ventrals orange yellow, dusky towards tip; lower side of head very bright silvery; inside and lining of gill cavity, cheeks and opercles with some light yellow. South Atlantic Coast of the United States, from Chesapeake Bay to Galveston, Texas; occasionally straying north to Woods Hole, not common, found in rather deep water.

Maryland localities: Bays along the ocean coast, according to Uhler and Lugger.

KING WILLIAM PERCH; MADEMOISELLE; YELLOW-TAIL

Bairdiella chrysura, (Lacépède)

Dipterodon chrysurus, Lacépède, Hist. Nat. Poiss., III, 64, 1802, South Carolina; after Linnæus.

Head 3 to 3⅓; depth 3 to 3⅓; eye 4¼ in head; snout 4¼. D. XI-I, 22; A. II, 10; scales 8-52-12. Body oblong, compressed, the back a little elevated, the profile depressed over the eyes; snout prominent, bluntish, as long as eye; lower jaw with a single series of close-set teeth, in front of which are a few smaller teeth not forming a definite series; upper jaw with an outer series of small curved canines, behind which is a moderate band of villiform teeth, becoming wider laterally. Preopercle serrate, the teeth near the angle larger, the lowest and largest directed downward. Gill rakers slender, rather long, 8 + 16. Scales on head cycloid. Base of anal little oblique; ventral outline rather regularly rounded; dorsal spines slender, the highest 2¼ in head; caudal long, double truncate; pectorals about as long as the ventrals, 1⅗ in head; soft dorsal and anal scaled at least ½ their weight; second anal spine moderate, 2⅓ in head, not as long as the soft rays, not reaching to tip of last ray when depressed. Mouth large, somewhat oblique, the premaxillary on the level of lower part of the eye; maxillary reaching middle of eye, 2 2/5 in head. Color greenish above, silvery below; back and sides more or less densely punctate with dark dots (especially in northern specimens), these forming narrow, somewhat irregular streaks along the sides; fins plain, mostly yellow in life. South Atlantic and Gulf Coasts of the United States, north to New York; very abundant on our sandy shores from Long Island to Texas. It reaches but a small size, hence, although an excellent pan fish, it has no great economic value. Unlike most of the species of the genus, its second anal spine is a little enlarged.

Maryland localities: Anne Arundel, St. Mary's and Worcester counties.

RED DRUM; CHANNEL BASS; REDFISH; PESCADO COLORADO; BULL REDFISH

Sciænops ocellatus, (Linn.)

Perca ocellata, Linnæus, Syst. Nat., ed. XII, 483, 1766, South Carolina.

Head 3½; depth 3½; eye 7 in head; snout 4. D. X-I, 24; A. II, 8; scales 4-45 to 50-12. Body elongate, rather robust, not much compressed; back somewhat arched; profile rather steep, somewhat convex; head long, rather low;

eye small; snout bluntish, rather long. Preopercle with its bony margin sharply serrate in young examples, becoming entire with age, the serrae entirely disappearing in specimens of 20 to 30 pounds weight; in these the even edge of the bone is wholly covered by skin; mouth large, nearly horizontal; maxillary not quite reaching posterior border of orbit, 2½ in head; teeth in both jaws in villiform bands, the outer series of the upper jaw much enlarged; lower teeth subequal; gill rakers 5 + 7, shorter than the diameter of the pupil; longest dorsal spine 2⅓ in head; second anal spine 1 2/5 in the

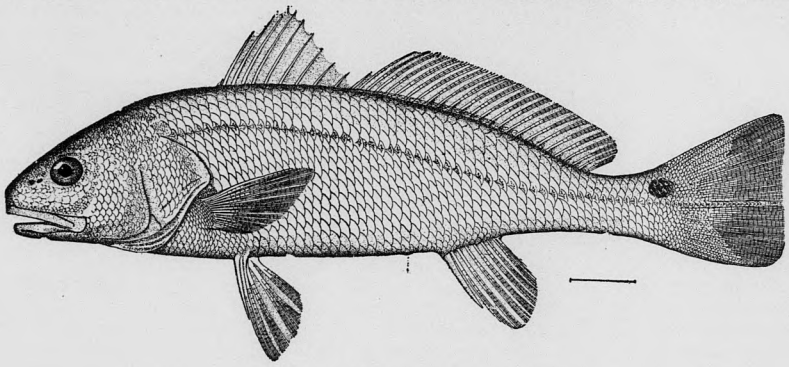


Fig. 49.—Sciænops ocellatus

longest ray, 3 2/5 in head; pectorals as long as ventrals, 2 in head; scales of the breast embedded, cycloid; soft dorsal scaleless; caudal fin slightly concave, about ½ as long as head. Color grayish silvery, iridescent; often washed with coppery red; each scale with a center of dark points, these forming rather obscure, irregular, undulating brown stripes along the rows of scales; a jet-black ocellated spot about as large as eye at base of caudal above, this sometimes duplicated; the body occasionally covered with ocelli. Length 2 to 5 feet; the weight 10 to 75 pounds. South Atlantic and Gulf Coasts of the United States, New York to Texas; very common along our coast, especially southward, where it is one of the largest and most important food-fishes. On the Texas coast, it exceeds in economic value all other fishes found there.

Maryland localities: Calvert, Somerset and Worcester counties. Runs of large size and in great numbers at certain seasons off Ocean City, Md.

GOODY; SPOT; POST-CROAKER; OLDWIFE; LAFAYETTE

Leiostomus xanthurus, (Lacépède)

Leiostomus xanthurus, Lacépède, Hist. Nat. Poiss., IV, 439, pl. 10, fig. 1, 1802, Carolina.

Head 3½ to 4½; depth 3; snout 3⅓ to 3½. D. XI, 31; A. II, 12; scales 9-60 to 70-12. Body short, deep, much compressed; back in front of dorsal compressed to a sharp edge; profile steep, convex, depressed over the eyes; dorsal outline convex, highest at front of dorsal; snout very blunt, as long as eye, 3½ to 3⅓ in head. Mouth small; maxillary three in head, extending to below pupil; no teeth in lower jaw in the adult; upper jaw with a series of narrow minute teeth; gill rakers short, slender, 8 + 22; lower pharyngeals small, with three series of molars posteriorly and many villiform teeth anteriorly; preopercle entire; preorbital broad, 1½ in eye; third dorsal spine highest, 1½ in head; soft dorsal with the sheath at its base formed by a single series of scales; caudal long and forked, as long as head; anal long and slightly falcate; second anal spine 2½ in the longest ray, 4 in head; ventrals ⅓ shorter than pectorals, which are long as the head; scales small, strongly ctenoid, extending on caudal and base of pectorals but not on other fins; lateral line little curved anteriorly; scales below lateral line in oblique series. Color bluish above, silvery below; about 15 narrow dark wavy bands extending from the dorsal downward and forward to below lateral line; a round black humeral spot rather smaller than eye; fins plain olivaceous, the caudal not yellow. This

species is one of the most common food-fishes of our Southern coast, being an excellent pan fish. Notwithstanding the numerous nominal species which authors have recognized, there is no evidence whatever of the existence of more

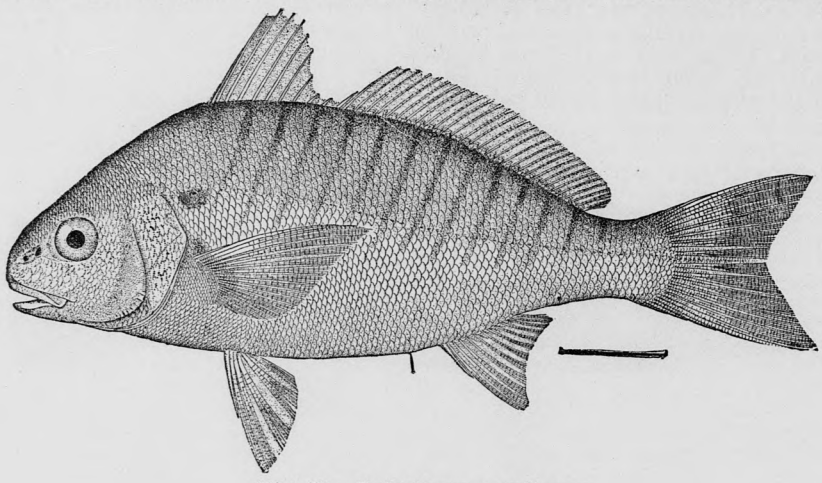


Fig. 50.—Leiostomus xanthurus

than one species of *Leiostomus* on our coasts. South Atlantic and Gulf coasts of United States; Cape Cod to Texas; once doubtfully recorded from Martinique.

Maryland localities: Anne Arundel, Baltimore, Cecil, Harford, Dorchester, Queen Anne, Kent, Somerset, St. Mary's and Worcester counties. D. C.

CROAKER; HARDHEAD; RONCADINA; CORVINA

Micropogon undulatus, (Linnæus)

Perca undulata, Linnæus, Syst. Nat., ed. XII, 483, 1766, S. C.

Head 3¼ (3⅔ with caudal); depth 3 4/5 (4 2/5); eye rather large, 6 in head, 1½ in interorbital width, 1¾ in snout, a little less than preorbital width. D. X-I, 25, or X-I, 24; A. II, 7, or II, 8; scales 7-53-13; pores 54. Body rather elongate, moderately compressed, the back a little elevated; anterior profile straightish or slightly undulate. Head long, rather low, the snout long and abruptly truncate at the tip, which projects but little beyond the premaxillaries. Mouth nearly horizontal, the lower jaw included, the maxillary barely reaching to opposite front of eye, its length 3 1/6 in head. Teeth in rather broad bands, the anterior in upper jaw little enlarged. Snout with the usual lobes and pores at tip, its length 3 1/6 in head; chin with five large pores; about 4 small barbels

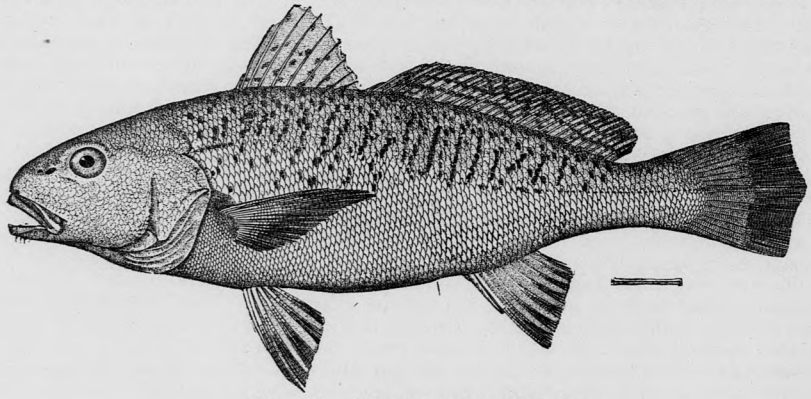


Fig. 51.—Micropogon undulatus

on the inner edge of each dentary bone anteriorly, these rather shorter than the posterior nostril, which is oblong and much longer than the anterior nostril. Gill rakers short, 7 + 12. Scales of moderate size; no scales on the dorsal or anal, except a basal series; caudal largely scaly. Lateral line becoming straight well in advance of anal. Spinous dorsal high, higher than in *M. undulatus*, its third spine not very much shorter than the fourth; third spine varying in length, about 2 in head. Color grayish silvery, without brassy tinge; dorsal region and sides above lower edge of pectorals marked with dark streaks extending obliquely upward and backward along the series of scales. Besides these, about ten short, oblique, dark bars extending downward and forward crossing the arched portion of the lateral line. Length 2 feet or less.

Cape Cod to Texas, important food fish in Maryland.

Maryland localities: Abundant in Chesapeake Bay and its tidewater tributaries and in Worcester county.

Carolina Whiting; Sand Whiting

Menticirrhus americanus, (Linnæus)

Cyprinus americanus, Linnæus, Syst. Nat., ed. X, 321, 1758, Carolina. Based on the Whiting of Catesby; not *Cyprinus americanus*, of 12th edition of Syst. Nat., which is a cyprinoid, *Abramis bosci*.

Head 3½; depth 4 to 5; eye 6⅔ in head; snout 3⅓. D. X-1, 24 or 25. A. I, 7; scales reaching nearly to middle of eye, 2 4/5 to 3 in head; eye small, teeth villiform, in broad bands, the outer series of the upper jaw very much enlarged, larger than in the other species; ventrals short, 1½ in pectorals; pectorals 1¼ in head; caudal f-shaped the broad rounded lower lobe longer than the acute upper; scales all ctenoid, those of the breast larger and regularly placed. Color, grayish silvery, with obscure darker clouds along the back and sides, these marks forming dusky bars, running obliquely forward and downward to considerably below the lateral line, these often obsolete, the bar at the nape saddle like; lining of gill cavity dusky; pectoral yellowish, dusky at tip; an obscure dusky streak along lower part of sides running into lower lobe of caudal. South Atlantic and Gulf coasts of the United States, Chesapeake Bay to Texas; very common on the sandy coasts of our southern states, where it is a food-fish of some importance.

Maryland localities: Calvert and St. Mary's counties.

Kingfish; Sea Mink; Northern Whiting

Menticirrhus saxatilis, (Schneider)

Johnius saxatilis, Schneider, Syst. Ichth., 75, 1801, New York.

Head 3¾ to 4; depth 4½ to 4⅔; eye 7 in head; snout 3¾. D. X-I, 26 or 27; A. I, 8; scales 7-53-14 pores. Outer teeth of upper jaw less enlarged; spinous dorsal elevated, the longest spine reaching past front of soft dorsal, its length 1½ in head; coloration strongly marked, body scarcely silvery. Profile slightly depressed above the eyes; eye small, 2⅓ in snout, 2 in interorbital area, snout long, bluntish; mouth large; maxillary reaching middle of eye, 2 4/5 in head; ventrals 1 1/7 in head; scales all ctenoid. Color dusky gray above, sometimes blackish, the back and sides with distinct dark oblique cross bands running downward and forward, the anterior one at the nape extending downward, meeting the second and thus forming a V-shaped blotch on each side; a dark lateral streak bounding the pale color of the belly, most distinct posteriorly and extending on lower lobe of caudal; inside of gill cavity scarcely dusky; pectorals dark. Atlantic and Gulf coasts of the United States. Cape Ann to Key West and Pensacola; most common northward on sandy bottoms. An excellent food fish. This species is generally common along the coasts of our Northern States, its greatest abundance being north of the limit of *M. americanus*, a species which it very closely resembles, the differences being of minor importance. Southward its distribution seems to be peculiar. A large specimen was obtained by Dr. Jordan at Pensacola and several small ones at Key West. All these are very dark in color, but not otherwise evidently different from the common northern form.

Maryland localities: Calvert, Somerset, St. Mary's and Worcester counties.

DRUM; BLACK DRUM

Pogonias cromis, (Linnæus)

Labrus cromis, Linnæus, Syst. Nat., ed. XII, 479, 1766, Carolina.

Head 3⅓; depth 2⅓; snout 3¾ in head. D. X-I, 21; A. II, 5 or 6; scales 5-47-9. Body oblong, the back much elevated, ventral outline almost straight, the depth rapidly diminishing from the first dorsal spine backward; profile rather steep and slightly convex; mouth moderate, inferior, the maxillary not reaching middle of eye; 3⅓ in head; teeth in broad bands, the outer series above scarcely enlarged; snout blunt, longer than eye; lower pharyngeals large, completely united, covered with many blunt molars and a small patch of conical teeth at the outer posterior corner; gill rakers 4 + 12, very short, slender; dorsal spines high but slender, the fourth highest, 2 in head; caudal subtruncate; second anal spine very large, about 2 in head; pectorals about as long as head; scales large, those on breast small. Color grayish silvery, with 4 or 5 broad dark vertical bars, these disappearing with age, usually no oblique dark streaks along rows of scales above; fins blackish. Atlantic Coasts of America, Long Island to mouth of the Rio Grande; common on the sandy coasts of the United States, where it reaches a very large size, probably the largest of all the Sciænidæ. The largest specimen recorded was taken at St. Augustine, Florida, and weighed 146 pounds. It is rather a coarse fish, of no great value as food.

Maryland localities: Worcester, Wicomico, Somerset, St. Mary's, Calvert, Dorchester, and Talbot counties.

Family **Labridæ**

BERGALL; CUNNER; CHOGSET; BLUE PERCH

Tautogolabrus adspersus, (Walbaum)

Labrus adspersus, Walbaum, Artedi Piscium, 254, 1792, after Bergall of Schöpf.

Head 3¼ to 3½. D. XVIII, 10; A. III, 9; scales 6-46-12; vertebræ 17 + 19 = 36; eye 4½ in head; pectoral 2; highest dorsal spine 2⅔; highest dorsal rays 2; third anal spine 2½. Body rather robust; head moderately pointed, much less obtuse than in *Tautoga;* snout moderate, longer than eye; mouth moderate, maxillary about reaching front of eye; 5 canines in front of upper jaw, about 4 in lower, the teeth on sides of jaw enlarging anteriorly; bands of small concave teeth behind canines; gill rakers very short, about 6 + 11; scales rather small; top of head, preorbital, maxillary, lower jaw, interopercle and posterior edge of preopercle and opercle naked; preopercle with about five rows of small scales; opercle with four or five rows of larger ones; fin naked. Color livid blue, shaded with brownish above and with more or less of a brassy luster on sides; head and back sometimes spotted with brassy; young with darker blotches and markings, and often a black blotch near middle of dorsal fin. Extremely variable in shades of coloration. This little fish is exceedingly abundant about rocks and wharves near shore in the regions where it is found. It reaches a length of about 10 inches, being too small to have much value as food, although its flesh is of excellent. These fishes although performing a useful duty as scavengers are a pest to the fisherman from their habit of nibbling the bait from their hooks.

Atlantic coasts of North America, from Labrador to Sandy Hook.

Maryland localities: Worcester county.

TAUTOG; BLACK-FISH; OYSTER-FISH

Tautoga onitis, (Linnæus)

Labrus onitis, Linnæus, Syst. Nat., ed. X, 286, 1758; ed. XII, 478, 1766. Type locality not given.

Head 3¼ to 3½; depth 2⅔ to 3. D. XVI, 10; A. III, 8; eye 5½ in head; snout 3; pectoral 1⅔; ventral 2; highest dorsal spine 3; highest dorsal ray 1 4/5; third anal spine 3; highest anal ray 1 4/5; scales 14-60-25. Body somewhat deep and compressed; profile moderately steep, well rounded from snout to dorsal; maxillary reaching the vertical from anterior nostril; jaws about equal, with 2 or 3 large canines and smaller ones on the side, which gradually diminish in size backward; gill rakers very short and blunt, about 3 + 6; a

patch of small scales behind eye extending downward to middle of cheek, where there are five or six series, head and opercles otherwise naked; pectorals broad and rounded, not quite reaching tips of ventrals; soft dorsal higher than spinous; caudal truncate or slightly rounded. Color blackish or greenish; the young usually with about three pairs of dark bars connected by reticulations; adult often nearly plain blackish; chin white; eye greenish. The tautog is one of the most valuable food-fishes of the Atlantic Coast. It is generally abundant within its range and its flesh is of superior quality. The largest specimen known, according to Dr. Goode, had a length of about three feet. Atlantic coasts of the United States, from New Brunswick to Charleston, S. C., about rocks and kelp in shallow water; New Brunswick (Goode); Casco Bay and Freeport, Maine (Kendall).

Maryland localities: Calvert and Worcester counties.

Family **Scaridæ**

BLUE PARROT-FISH

Scarus cæruleus, (Bloch)

Coryphæna cærulea, Bloch, Ausländische, Fische, II, 120, pl. 176, 1786, in part; after Catesby, and a figure of Aubriet, altered from a figure by Plumier.

Body rather elongate, the form subelliptical in the young, becoming deep with age, a great fleshy hump on the forehead in old individuals. Head 3⅛ (3 5/6 with caudal); depth 3⅛ (3 5/6). D. IX, 10; A. II, 9; scales 2½-24-6; eye small, 5⅔ in head; snout rather acute, 2 4/5 in head. Jaws small, with smooth edges, whitish in the adult, rosy in the young; no posterior canine teeth; upper lip covering about ½ of upper jaw; cheek with rows of scales, the scales of the upper row nearly twice as broad as those of the lower; below the lower part is a partial row of two scales; 6 scales on median lines of back before dorsal. Pectoral not reaching past tips of ventrals; origin of ventral spine under posterior end of pectoral base, ventrals reaching midway between base of fins and front of anal; caudal slightly rounded; when spread open its outer rays a little produced, 1 2/5 in head in young of a foot in length, said to be much longer in adult. Adult deep uniform blue; partly grown specimens (from Havana) bright sky blue everywhere; some brown on upper scales. Young (4 inches Key West) light, livid blue gray, tinged with brownish on back, quite bluish below; yellowish olive on top of head, but no sharp markings anywhere except on fins. Color in spirits, greenish olive above, pale below; dorsal dusky; caudal and anal grayish; fins otherwise pale. Large examples from Jamaica have the following colors: Body ultamarine blue; fins blue, dorsal edged with darker blue, the membrane of spinous dorsal blackish at base; a sky blue band from eye to and across each lip; a pale band below it on under lip, a narrow pale edging above; pectoral with base and upper ray blue, rest of fin pale; anal deep blue, blackish at base; ventrals blue, the last rays paler; caudal deep blue, the outer rays darker, posterior edge pale; teeth pale. Specimens about 6 inches long have the back yellow, scales on sides yellow with green edges; belly nearly uniform greenish; outer rays of caudal deep green, middle rays paler; dorsal yellow, edged with green; anal pale yellowish, edged with green; pectorals nearly colorless, slightly orange at tip; ventrals greenish. Length of example, described from Havana, 10½ inches. The species reaches a length of two or three feet. West Indies; generally common; straying northward along the coast of the United States; taken in abundance in pound nets off St. George Island, Md., about 12 miles from Chesapeake Bay, in August, 1894, some specimens weighing 12 pounds. Abundant about Key West and in the Bermudas.

Maryland localities: Off St. George Island, St. Mary's county, according to Dr. H. M. Smith.

Family **Ephippidæ**

ANGEL FISH; SPADE-FISH

Chætodipterus faber, (Broussonet)

Chætodon faber, Broussonet, Ichth. Dec., I, v, pl. 4, 1782, Jamaica.

Head 3 to 3½; depth 1 to 1½. D. VIII-i, 20; A. III, 18; scales 60; caeca 4 to 6. Vertical fins low in the young, falcate in the adult. Third dorsal spine more

than ½ head, in adult about as long as from tip of snout to edge of preopercle, its membrane blackish, more produced in the young; chin with a row of pores; preorbital nearly as wide as eye; pectoral considerably shorter than ventral. Grayish, a dusky band across the eye to the throat, a second similar band beginning in the front of the dorsal and extending across base of pectoral to belly;

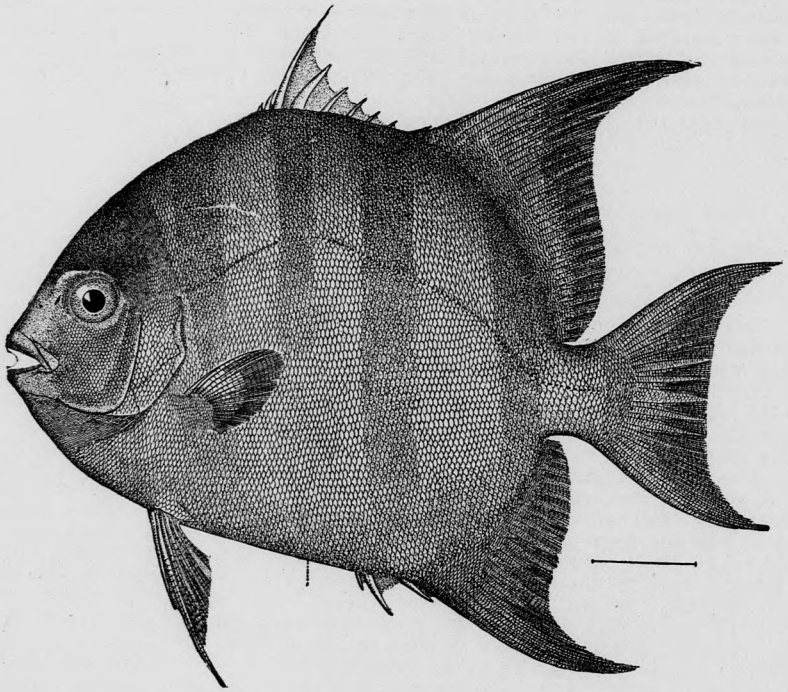


Fig. 52.—Chætodipterus faber

a third band extending to middle of sides, from the base of fourth and fifth dorsal spines; the remaining bands alternately short and long; all of these bands disappearing with age; ventrals black. Length two to three feet. Cape Cod to Rio Janeiro; very abundant on our South Atlantic coast; an excellent food-fish reaching a large size.

Maryland localities: Worcester, Calvert, Somerset and St. Mary's counties.

Family **Triglidæ**

COMMON GURNARD; RED-WINGED SEA ROBIN

Prionotus carolinus, (Linnæus)

Trigla carolina, Linnæus, Mantissa, 176, 528, Carolina.

Body not very slender; head moderate, 3; depth 5. Mouth comparatively small, the maxillary about three in head, the mandible not reaching vertical from front of eye; groove across top of head behind eye very conspicuous; interorbital area moderately concave, rather broad, about equal to diameter of eye; bones of head comparatively smooth. Pectoral fin short, reaching little past front of anal, its length less than ½ the body; gill rakers of moderate length, about 10 developed. Dorsal spines low. Scales rather large, about 58 pores. Body and fins nearly plain, mottled with darker. Back with four

obscure cross blotches. Young with head rougher; pectoral fins shorter, dark spots on body more distinct. Coast of Maine to South Carolina, chiefly north-

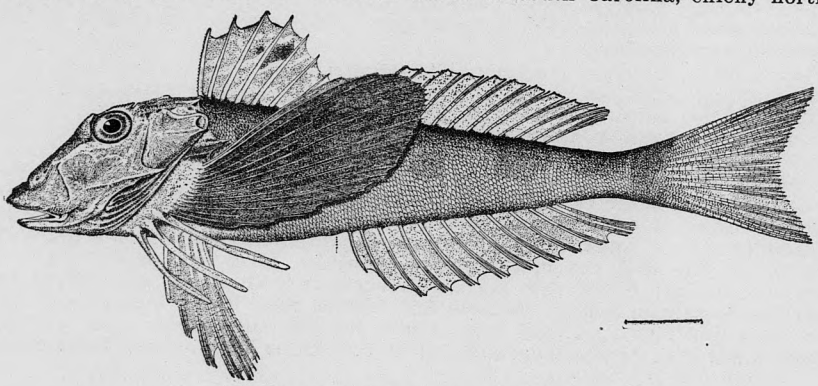


Fig. 53.—Prionotus carolinus

ward. Very abundant on the coasts of southern New England and New York, but rarely taken as far south as Charleston.

Maryland localities: Worcester county, Potomac River, Sinnepuxent Bay and Eastern Shore of Tangier Sound, according to Uhler and Lugger.

SOUTHERN STRIPED GURNARD

Prionotus evolans, (Linnæus)

Trigla evolans, Linn., Syst. Nat., ed. XII, 498, 1766, Carolina .

Body and head stouter than in *Prionotus strigatus*. Head 2⅖; depth 4¾. D. X-12; A. 11; lateral line with 53 pores; soft dorsal high. Scales larger than in *Prionotus strigatus*, 8 + 1 + 21 in a vertical line from last dorsal spine to vent; interorbital space more deeply concave, its width in adult not quite length of eye; first dorsal spine nearly smooth; second spine three in head; pectorals a little more than one-half of the body. Color in life olive brown above, becoming light olive on sides, white below; back with three brown cross

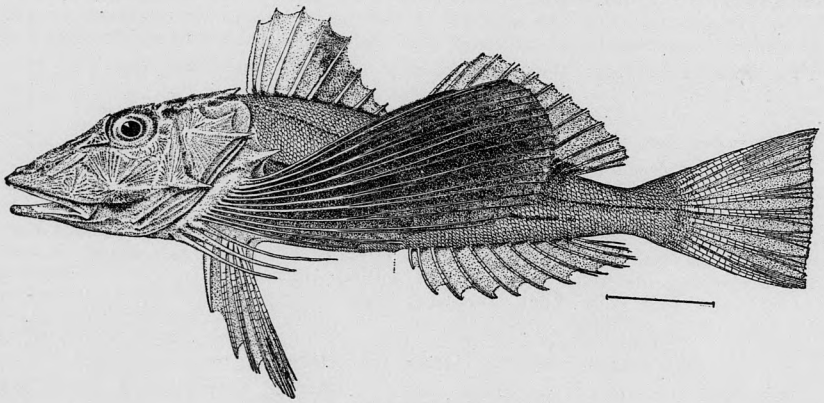


Fig. 54.—Prionotus evolans

bars, the first under spinous dorsal the second under first third of second dorsal, the third under its end, all of these bars extending downward and forward to lateral line. The gill rakers are slender and fine, 18 to 20 developed on lower limb; the spines on the head are not as strong as in *P. tribulus*, that above orbit behind not conspicuously raised above surface of head. South Atlantic

Coast of United States; known only from North and South Carolina, where it is locally abundant.

Maryland localities: Worcester county. Uhler and Lugger report it from lower Chesapeake Bay.

Family **Dactylopteridæ**

FLYING-ROBIN; MUCIELAGO; VOLADOR; BATFISH; FLYING GURNARD

Cephalacanthus volitans, (Linnæus)

Trigla volitans, Linnæus, Syst. Nat., ed. X, i, 302, 1758.

Head 4⅓; depth 5½. D. II-IV, 8; A. 6; P. 28 + 6. First two dorsal spines free, slightly connected by membrane at base; preopercular spine reaching beyond bases of pectorals, not to end of occipital spine; pectorals reaching nearly to base of caudal in adult, very much shorter in young; in the young the spines of the head are much longer. Greenish olive and brown above, of varying shades; below pale marked irregularly with dusky and bright red, varying to salmon yellow; pectoral fins mottled with bright blue streaks near the base and blue spots and bars toward the tip; their under sides glaucous blue, edged with darker; caudal fin with about three brownish-red bars; colora-

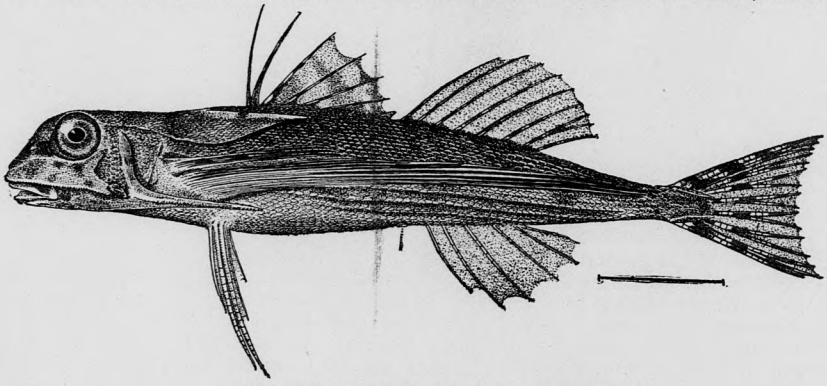


Fig. 55.—Cephalacanthus volitans

tion extremely variable. Length 12 inches. Atlantic Ocean on both coasts; very abundant on South Atlantic and Gulf coasts; a handsome and singular fish.

Maryland localities: Worcester county. Lower Chesapeake Bay.

Family **Cottidæ**

FRESH-WATER SCULPIN

Uranidea gracilis, (Heckel)

Cottus gracilis, Heckel, Ann. Wien. Mus., II, 1839, 148, New York.

Body rather slender, fusiform; head 3½; depth 5. D. VIII, 16; A. 12. Preopercular spine moderate, concealed. Mouth rather large, the maxillary reaching to the pupil; pectorals reaching front of anal; ventrals about to vent. Color olivaceous, mottled, upper edge of spinous dorsal red in life. Streams of New England and New York, recorded from tributaries of the Connecticut, Lake Champlain, Hudson, Delaware and Susquehanna; common; probably a variable form, including several of Dr. Girard's nominal species, as Dr. W. O. Ayres vigorously insisted in 1845, before the latter had been described.

Maryland localities: Baltimore, Carroll, Garrett, Montgomery and Washington counties.

SEA RAVEN

Hemitripterus americanus, (Gmelin)

Scorpæna american d'Amerique of Duhamel, Gmelin, Syst. Nat., 1220, 1788, after "Diable en crapand de Mer d'Amerique" of Duhamel de Monceau, Peche, iii, 2, 93.

Body villous; head 2⅔; depth 3¾. D. VI, XII-1, 12; A. 13; scales 40. The prickles enlarged and tubercle-like along the back, and lateral line; nasal spines

strong; supraocular ridge much elevated, with dermal flaps and two blunt spines; three pairs of fleshy slips on nasal bones and two on supraocular ridges; smaller cirri on maxillary, on preorbital and several on lower jaw; interocular space very deeply concave; two blunt occipital spines on each side, outside of which are two or three others; opercle small, with a bony ridge; preopercle with two blunt spines, below which are one or two others; lower jaw slightly projecting; maxillary reaching beyond eye about ½ head; pectorals nearly reaching anal; highest dorsal spine 1⅔ in length of head, as long as caudal; ventrals reaching halfway to anal. Reddish brown, marbled with darker brown, and much variegated; yellowish below; fins variegated with light and dark. Length eight inches. Atlantic coast of America, chiefly northward, from New York to Labrador, not rare, common at Woods Hole in October and November; a most remarkable looking fish.

Maryland localities: Worcester county.

Family **Cyclopteridæ**

LUMPFISH; COCK AND HEN PADDLE; LUMP SUCKER

Cyclopterus lumpus, (Linnæus)

Cyclopterus lumpus, Linn., Syst. Nat., ed. XII, I, 260, 1766, Baltic and North Seas.

Body massive, compressed, subtriangular in transverse section through the middle, belly flattened, the portion behind the abdominal chamber much compressed and less than ½ the length of the body proper. Head short, 5 in entire length; depth 2; forehead broad, flattened; nape high; snout short, broad, blunt; mouth wide, anterior, opening with a slight upward direction, extending backward almost to a vertical from the front margin of the eye. D. VI to VIII, 11; A. 9 or 10; ventral 6; pectoral 20; caudal 12 to 14; branchiostegals 6; vertebræ 11 + 18 = 29. Eyes lateral near the top of the head, as long as the snout, ¼ as long as the head and ⅓ as wide as the interorbital space. Gill opening moderately wide. Fins with rounded margins, rough with small tubercles. Skin thickly sown with small irregular subconical protuberances. The fleshy ridge enveloping the first dorsal is subject to considerable variation; it usually continues forward on the nape and becomes indefinite at the occiput. In alcohol the colors are brownish or olive to grayish, the tubercles darker. In life the tints vary from yellowish or greenish in the young to more or less brilliant red in the males, or bluish to dark brown in the females. The young often take the color of their surroundings. North Atlantic on rocky shores of both coasts; south to Cape Cod and France; generally abundant, reaching a length of 20 inches or more, but usually much smaller; they are rarely used as food. According to Garman, the Lumpfish spawns near shore in March or April, after which the female retires to deep water, leaving the male to watch the eggs which hatch among seaweed and eelgrass.

Maryland localities: Worcester county.

Family **Echeneididæ**

SHARK-SUCKER; PEGA; PEGADOR; SUCKING-FISH

Echeneis naucrates, (Linnæus)

Echeneis naucrates, Linnæus, Syst. Nat., ed. X, 261, 1758, "in Pelago Indico."

Body elongate, subterete, slender. Head 5¼; depth 11 to 12. D. XXII to XXVIII (rarely XXI) 32 to 41; A. 31 to 38. Breadth between pectorals 7½; disk 4 to 5 in body; eye 5 in head; snout 2⅓; maxillary 3; from angle of mouth to tip of lower jaw 2⅔; pectoral 1 2/5; ventral 1½; middle caudal rays 1 2/5; highest anal ray 2; highest dorsal ray 2⅓. Color, brownish. Warm seas, universally distributed; common north to Cape Cod and occasionally to San Francisco, attaching itself to turtles and to large fishes. This species is very common in the tropics, being found attached to sharks, groupers, or any other large fish, without regard to species. Few large sharks at Key West are without them.

Maryland localities: Worcester county. Occasional in Chesapeake Bay, according to Uhler and Lugger.

SUCKER; PILOT; SHARK-SUCKER

Echeneis naucrateoides, (Zuiew)

Echeneis naucrateoides, Zuiew, Nova Acta Acad. Sci. Imp. Petropol., IV, 1789, 279, no locality.

Head 5; depth 11. D. XX or XXI-32 to 35; A. 33 to 35. Disk 3⅔ to 3¾ in total, twice width of body between pectorals. In all other respects essentially as in *Echeneis naucrates*, the disk longer, but composed of fewer laminæ, the laminæ being farther apart. Color of *Echeneis naucrates*. Cape Cod to West Indies, common on our south Atlantic coast.

Maryland localities: Worcester county. Southern Chesapeake Bay, according to Uhler and Lugger.

REMORA

Remora remora, (Linnæus)

Echeneis remora, Linnæus, Syst. Nat., ed. X, 260, 1758.

Head 4; disks 2¾; width between pectorals 5¼. D. XVIII-23; A. 25; vertebræ 12 + 15. Body comparatively robust, compressed behind. Pectoral fins rounded, short and broad, their rays short and flexible; ventrals fins adnate to the abdomen for more than one-half the length of their inner edge. Tip of lower jaw not produced into a flap; head broad, depressed; disk longer than the dorsal or the anal fin; maxillary scarcely reaching front of orbit. Caudal lunate; vertical fins rather high; pectoral 3/5 length of head. Color blackish, nearly uniform above and below. Length 15 inches. Warm seas, north to New York and San Francisco, where it is not rare; usually found attached to large sharks; very common in the West Indies; more robust than *Echeneis naucrates*, and reaching a smaller size.

Maryland localities: Worcester county.

SPEARFISH SUCKER

Rhombochirus osteochir, (Cuvier)

Echeneis osteochir, Cuvier, Règne Anim., ed. 2, II, 348, 1829.

The length of the body is four and two-thirds times the length of the head, two and one-fourth times the length of the disk and five times the width between the pectorals; mouth very small, maxillary not reaching to the line of orbit; disk very large, extending forward beyond tip of snout; caudal fin emarginate, with rounded angles. D. XVIII-21 to 23; A. 20; P. 20. Light brown; under side of head, ventral line, part of ventrals and a spot on pectorals pale.

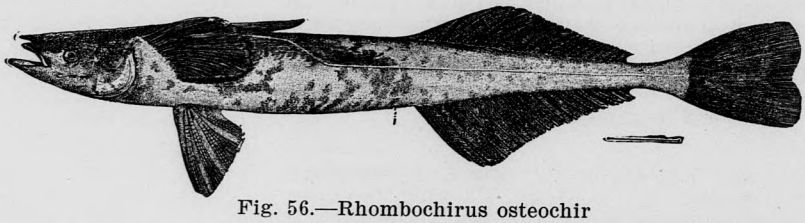


Fig. 56.—Rhombochirus osteochir

This small species inhabits the West Indies and ranges northward occasionally to Cape Cod. It is parasitic on the species of spearfish and is rather rare. It was recorded at Woods Hole, Mass., by Prof. Baird in 1871. According to Dr. Smith, a specimen was taken August 6, 1886, in a fish trap at Quissett harbor, near Woods Hole.

Maryland localities: Chesapeake Bay

Family **Balistidæ**

LEATHER JACKET; TRIGGER FISH

Balistes carolinensis, (Gmelin)

Balistes carolinensis, Gmelin, Syst. Nat., 1, 1468, 1788, Carolina.

Body ovate, compressed, covered with scales. Mouth small, terminal, jaws short, each with one or more series of separate incisor-like teeth; eye very high;

gill openings small, slit like. Dorsal separate, the first of one to three spines. Second dorsal and anal long. Pubic bone long, movable with sometimes a spine at its end. Color brownish. Second dorsal and anal with brown streaks. Caudal mottled.

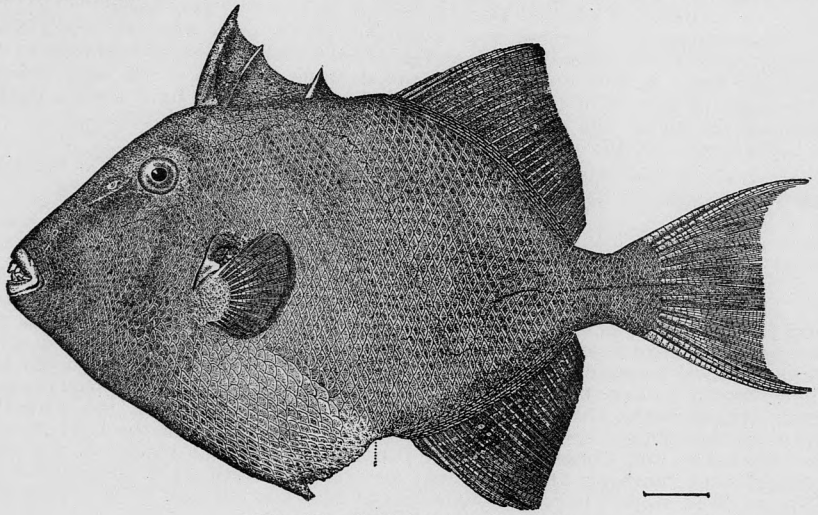


Fig. 57.—Balistes carolinensis

Head three; depth 1 4/5. D. III to 27. A. 25 lat. L. 51 to 62. Length 18 inches or more. Habitat warm seas, north to New England.

Maryland localities: Rare in the southern part of Chesapeake Bay. Worcester county.

Family **Monacanthidæ**

THE MASSACHUSETT'S FILE FISH

Monacanthus hispidus, (Linn.)

Balistes hispidus, Linnæus, Syst. Nat., ed. XII, 405, 1766, Carolina.

Monacanthus massachusettensis, Storer, Fish. Mass., p. 174, and Mem. Am. Ac., VIII, p. 425, (Pl. 34, fig. 4); De Kay, New York Fauna, Fishes, p. 336; pl. 57, fig. 187.

Body oblong, very much depressed; skin covered with small stellated plates, which are so disposed as to feel slightly rough only when the hand is moved towards the head. D. 1, 34; P. 12-15; A. 30-34; C. 12-13. The strong, granulated, curved spine, representing the first dorsal fin, is half the length of the head, and has a double series of sharp, decurved teeth behind; yellowish brown, with faint abbreviated brownish blotches along the sides, most obvious upon the upper portion. Length, 3 to 4 inches.

Maryland localities: Lower Chesapeake.

FILE FISH; ORANGE FILE FISH; LIJA; FOOL FISH

Alutera schœpfii, (Walbaum)

Balistes schœpfii, Walbaum, Artedi Pisc., III, 461, 1792, Long Island.

Head 3⅔ in length; depth 2 in adult to 2⅓ in young. D. I, 36; A. 38. Eye small, about 4 in snout. Gill slit nearly twice as long as eye. Anterior profile very slightly convex, growing steeper with age. Pectoral fins scarcely ½ longer than eye; dorsal spine slender and weak, longer in the young. Dorsal and anal fins low; caudal very long in young, becoming shorter in adult. Scales minute, uniform over body. Color, dirty olive gray, varying to orange yellow. Length 24 inches. Cape Cod to Florida and Texas; rather frequent on sandy shores, especially in the Carolinas. A large lank fish, of unattractive form and useless as food.

Maryland localities: Somerset, St. Mary's and Worcester counties.

Family **Ostraciontidæ**

THE TRUNK FISH

Lactophrys trigonus, (Linn.)

Ostracion trigonus, Linn., Syst. Nat., ed. X, 1758, 330, India.

Body triangular, covered with hexagonal plates, each with six raised lines, diverging from the centre, to the angles; these plates are larger posterior to the pectoral fins. A flat, prominent, recurved spine is situated on each side of the posterior portion of the abdomen. The color above is a light leaden, darker between the dorsal and caudal; abdomen white. Length, 14 inches.

Fin-rays:—D. 10; P. 12; A. 10; C. 10.

Maryland localities: Occurring very rarely in the salt waters of the southern part of Chesapeake Bay, and around the extremity of St. Mary's county.

CUCKOLD; TORO; COWFISH

Lactophrys tricornis, (Linnæus)

Ostracion tricornis, Linn., Syst. Nat., ed. X, 331, 1758, India.

Head 4¾; depth 2⅓. D. 10; A. 10. Carapace trigonal; adults with a broad low ridge on each side of the back, the dorsal ridge more elevated than in the young, which are somewhat tetragonal. Ventral surface nearly flat; a stout spine directed forward over each eye; abdominal spines flat, directed backward. Color brown, yellow, blue or green, with irregular blue blotches. Young light gray, tinged with olive. Length 18 inches. Tropical parts of the Atlantic; very common from Carolina to Brazil, ranging northward in the Gulf Stream to Charleston and Chesapeake Bay. Occasional about the shores of the Gulf of Mexico, at Pensacola and Galveston; also ranging eastward to Guinea and the Cape of Good Hope. Rarely brought to the markets, but said to be a good fish when baked in the shell.

Maryland localities: Ocean City. Goode reports one from Gwyn's Island, Chesapeake Bay on October 11, 1877.

Family **Tetrodontidæ**

THE SWELL TOADS OR PUFFERS; SMOOTH PUFFER; JUGFISH

Lagocephalus lævigatus, (Linnæus)

T. lævigatus, Linn., Syst. Nat., 1, p. 411; De Kay, New York Fauna, Fishes, p. 329, pl. 56, fig. 182; Storer, Mem. Amer. Acad., VIII, p. 418, pl. 34, fig. 1

Body elongate, cylindrical, gradually tapering behind, anterior portion of body most prominent; abdomen pendulus and covered with small three rooted spines. Uniform deep olive green above, sides silvery, abdomen white. Length 1 to 2 feet. D. 13 to 14; A. 12; P. 16 to 17; C. 11 to 13.

Maryland localities for this singular fish are the coast of Worcester county, and the southern part of Chesapeake.

THE COMMON PUFFER OR SWELL FISH

Tetrodon maculatus, (Schneider)

T. hispidus var. *maculatus*, Schneider, Syst. Ichth., p. 504, 1801, Long Island, after Schöpf.

This fish has a comparatively short, cylindrical body, nearly globular when inflated; covered with small acute spines having trifid bases, most numerous between the eyes and on the back. D. 6-8; A. 6-8; P. 15; C. 6-9.

Color dark olive green above, more or less yellowish on sides, lower parts white. Sides transversely barred by several blackish, irregularly defined bands. Length 6 to 12 inches, exceedingly common in the lower Potomac, throughout Chesapeake Bay and the coastal waters of Worcester county. It is valuable only as a curio, takes a hook readily and is often a nuisance to anglers fishing for better fishes.

Maryland localities: Chesapeake Bay, generally, and in Worcester county.

TAMBOR; GLOBE FISH

Tetrodon testudineus, (Linnæus)

Tetrodon testudineus, Linnæus, Syst. Nat., ed. X, 1758, 332. On Balk and Artedi.

Similar to the above; snout moderately long, 2 in head; eye small, about 7½ in head, nearer gill-opening than end of snout; width between orbits equal to ¼ length of head.

D. 8; A. 6. Skin of back from nape to before dorsal fin covered with small sparsely set prickles. Back dark olivaceous, with whitish curved lines and streaks paler than the ground color.

This species, common to the West Indies, strays northward to the New England coast.

Maryland localities: Lower Chesapeake and Worcester county.

Family **Diodontidæ**

THE SEA PORCUPINE

Diodon hystrix, (Linnæus)

D. hystrix, Linn., Syst. Nat., ed. X, 1758, 335, India.

Form oval, dilated like a cushion, but flattened on the back, beset with moderately long, white spines, which slant backwards when the creature is not irritated; color pale brownish, beneath whitish, the sides and back with round, brown dots, and the fins with smaller, closer dots; length extending to two feet, but always smaller in Chesapeake Bay.

Fin rays: D. 13; P. 25; A. 14; C. 8.

Has been caught a few times with hook and line on the coast of Worcester county, and in the Chesapeake off the southern extremity of St. Mary's county.

Being covered with stout and sharp spines; it is an object of great disgust to the unlucky fisherman who chances to find one attached to the end of his line. They swell themselves into a round ball, beset in every direction with long spines, and with the spaces between the spines too small to admit the fingers of the human hand.

Maryland localities: Worcester, Somerset, Calvert and St. Mary's counties.

THE BURR FISH

Chilomycterus schœpfi, (Walbaum)

Diodon schœpfi, Walbaum, Artedi, Pisc., III, 601, 1792, Long Island.

Body moderately depressed; head broad; snout obtusely convex. Eye circular; mouth with thick fleshy rounded lips. Body covered with short stubby

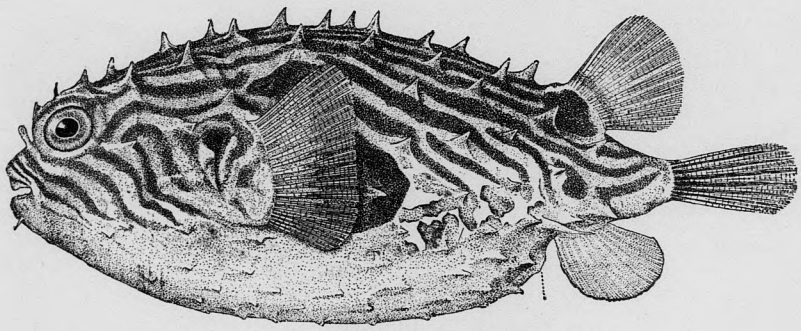


Fig. 58.—Chilomycterus schœpfi

spines. Color a clear translucent brownish with broad vermiculating lines of much deeper brownish. A jet black blotch at base of dorsal and another just above pectoral. Length of head 2¾ in body; depth 3. D. 1, 9; A. 1, 9.

Maryland localities: This species, merely a curio, is very abundant in the shallow waters of the bay, and along the beaches of Worcester county.

Family **Molidae**

THE OCEAN SUN-FISH OR SHORT HEAD

Mola mola, (Linnæus)

Tetrodon mola, Linnæus, Syst. Nat., ed. X, 1758, 334, 412, Mediterranean.

Broad, oval, blunt behind, compressed, no scales, nor lateral lines. Head not distinct from the trunk. Back dark gray, abdomen white, the sides soiled white

with silvery reflections, a broad almost black band commences at the origin of the dorsal fin, is continued in front of the caudal and anal fins to the vent. Length, 3 to 4 feet.

Fin rays: D. 13; P. 12-13; A. 13-15; C. 8-9.

The caudal fin is connected both with the dorsal fin and the anal.

Maryland localities: Occurs in the ocean on the coast of Worcester county.

Family **Bothidæ**

WINDOW PANE

Lophopsetta maculata, (Mitchill)

Pleuronectes maculatus, Mitchill, Rept. Fish. N. Y., 9, 1814, New York.

Head 3½; depth 1⅗; D. 65; A. 52; scales, 85; eye, four in head; pectoral, 1⅓; highest dorsal rays, 1⅞; highest anal rays, 1 4/5; interorbital space ½ eye. Body broadly rhomboid, strongly compressed, translucent in life; mouth large, the maxillary reaching nearly to posterior margin of eye. Teeth in each jaw in one series laterally, in a very narrow band in front; interorbital space rather broad, slightly concave, its posterior third or fourth with scales; gill rakers short and slender, about 8+25; maxillary, mandibles, snout, and the greater part of interorbital naked; scales on head and body cycloid, loosely imbricated, those on the blind side a little smaller. Anterior rays of dorsal produced, their ends branched and free, the first on tip of snout, the rays at the beginning of posterior third of fin the highest; origin of anal fin directly under angle of pre-

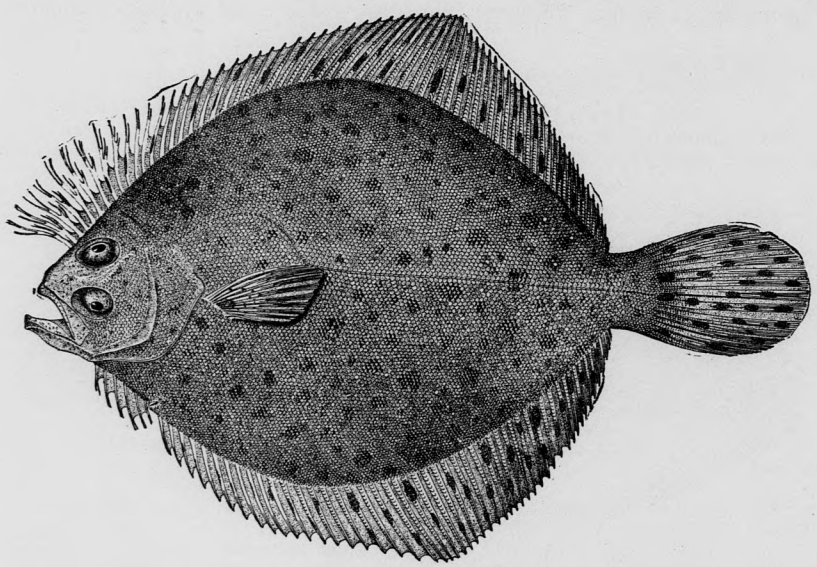


Fig. 59.—Lophopsetta maculata

opercle; base of ventrals long, that of the eyed side extending along ridge of body from notch in isthmus to front of anal, base of ventral on blind side shorter; pectoral reaching past curve on eyed side, its mate much smaller; caudal rather long. Color light olive brown, almost translucent, everywhere marbled with paler, and with many small, irregular sharply defined black spots; dorsal, anal, and caudal with larger, round, blended spots of dark brown; pectoral with brown interrupted cross lines. This small flounder much resembles the European Brill (*Bothus rhombus*), but is smaller, thinner, and more translucent in body. Its weight rarely exceeds a pound or two, and its value as a food-fish is but slight; nevertheless, it is a near ally of the European turbot

(*Psetta maxima*), and in its technical characters it very closely agrees with the latter species. Atlantic coast of United States, from Casco Bay to South Carolina; common.

Maryland localities: Worcester county.

Summer Flounder

Paralichthys dentatus, (Linnæus)

Pleuronectes dentatus, Linn., Syst. Nat., ed. XII, 1, 458, 1766.

The depth of body is contained 2⅓ times in its length. Body oblong, moderately compressed; mouth wide, oblique, the mandible very heavy and much projecting; 8 to 10 teeth on side of lower jaw, the two anterior teeth very long; anterior teeth of upper jaw strong. Scales small, cycloid. Gill rakers lanceolate,

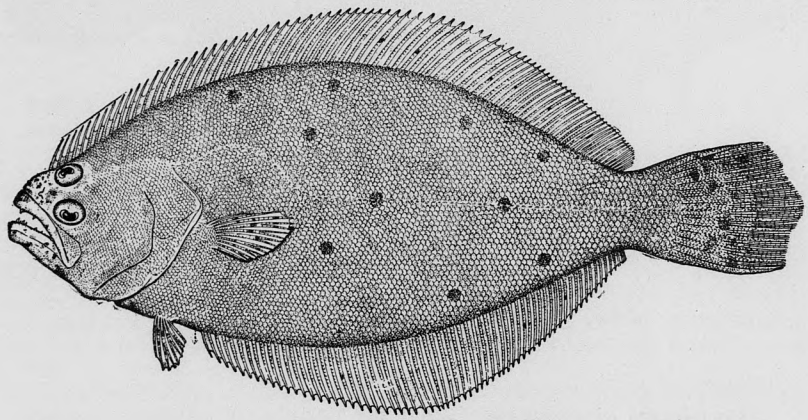


Fig. 60.—Paralichthys dentatus

dentate, stoutish, wide set and much shorter than eye, about two plus ten in number. D. 85 to 93; A. 65 to 73; Lateral line about 100.

Blackish olive, mottled and blotched with darker; adults with numerous small white dots on body and vertical fins; about 14 ocellated dark spots on side. The "Chicken Halibut," as it is often styled by Maryland fishermen, especially in Chesapeake Bay, feeds on small fishes, crustaceans, mollusks, and squid. It grows to a length of three feet, a weight of 26 pounds and is a food-fish of some importance.

Maryland localities: Chesapeake Bay and the Ocean Beach of Worcester county.

Four-Spotted Flounder

Paralichthys oblongus, (Mitchill)

Pleuronectes oblongus, Mitchill, Trans. Lit. and Phil. Soc. N. Y., I, 391, 1815.

Body comparatively elongate, strongly compressed. The depth of the body is contained two and one fourth times in the length of the body, which is four times the length of the head. Eyes large, nearly four times in head, separated by a prominent narrow, sharp ridge; upper jaw with very numerous small, close set teeth laterally, and four or five canines in front, the lateral teeth abruptly smaller than the anterior; each side of lower jaw with seven to ten teeth; chin prominent; maxillary narrow, reaching past middle of pupil, two and one fourth in length of head; gape curved; scales weakly ctenoid or cycloid; gill rakers thick, rather long, few, about eight below angle; dorsal low, beginning over front of eye, some of the anterior rays exserted, but not elongate, the longest rays behind middle of fin, not quite half head; caudal one and one fourth

in head; pectoral one and three fifths; anal spine obsolete. D. 72; A. 60; Lat. line 93. (D. 79; A. 59, according to Mitchill; D. 86; A. 76, according to Storer.)

Grayish, thickly mottled with darker and somewhat translucent; four large, horizontal oblong, black ocelli, each surrounded by a pinkish area, one just be-

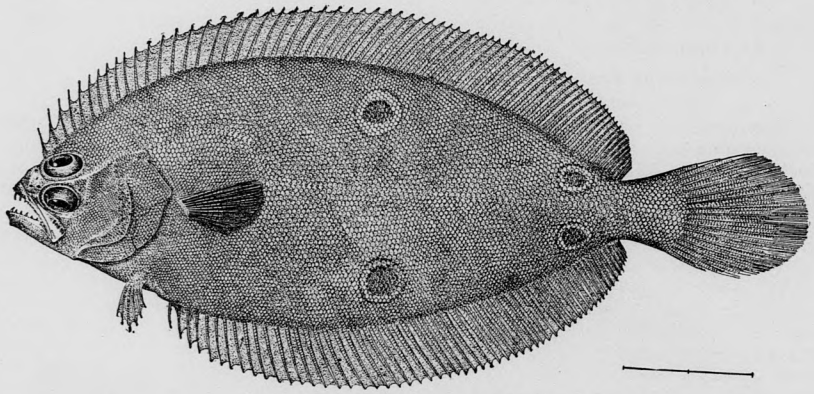


Fig. 61.—Paralichthys oblongus

hind middle of body below the dorsal, one opposite this above anal; two similar smaller spots below last rays of dorsal and above last of anal. Atlantic coast, northward; not abundant.

Maryland localities: Worcester county.

Family **Pleuronectidæ**

HALIBUT

Hippoglossus hippoglossus, (Linnæus)

Pleuronectes hippoglossus, Linn., Syst. Nat., ed. X, 269, 1758, European Ocean.

Body comparatively elongate, not strongly compressed, deep mesially, thence rapidly tapering each way; head 3¾, broad; depth about 3. D. 105; A. 78; scales 150 or more. Eyes large, separated by a very broad flattish area; lower eye slightly advanced; mouth large, the maxillary reaching middle of orbit. Nearly uniform dark brown; blind side white. One of our most important food-fishes, reaching a weight sometimes of 400 pounds. Found in all northern seas, southward in deep water to France, Sandy Hook, and occasionally to the Farallones off San Francisco; abundant throughout the North Atlantic as also the North Pacific and Bering Sea, in water of moderate depth; taken with hook and line on all cod banks.

Maryland localities: Worcester county.

SAND DAB; FLUKE

Limanda ferruginea, (Storer)

Platessa ferruginea, Storer, Rept. Fish., Mass., 141, pl. 2, 1839, Cape Ann.

Body ovate-elliptical, strongly compressed. Head 4 in length; depth 2 1/5. D. 85; A. 62; scales 100. Teeth small, conical, close set, in a single series on each side in each jaw, about 11+30 in the lower jaw; snout projecting, forming a strong angle above upper eye with the descending profile; gill rakers of moderate length, very weak, not toothed; eyes moderate. Scales imbricate, nearly uniform, those on right side rough ctenoid, those on left side nearly or quite smooth; scales on body rougher than on cheeks; caudal peduncle short, higher than long; dorsal inserted over middle of eye, its middle rays highest. Brownish olive with numerous, irregular reddish spots; fins similarly marked; left side with caudal fin, caudal peduncle and margins of dorsal and anal fins lemon yellow. Atlantic Coast of North America, Labrador to New York. This species is rather common northward on our Atlantic coast.

Maryland localities: Worcester county.

COMMON FLATFISH; WINTER FLOUNDER

Pseudopleuronectes americanus, (Walbaum)

Pleuronectes americanus, Walbaum, Artedi Piscium, 113, 1792, based on the Flounder of Schöpf.

Body elliptical; an angle above eye. Head 4 in length; depth 2¼. D. 65; A. 48; scales 83. Head covered above with imbricated, strongly ctenoid scales, similar to those on body. Teeth compressed, incisor-like, widened toward tips, close set, forming a continuous cutting edge; some of teeth often emarginate sometimes movable; right side of each jaw toothless. Highest dorsal rays less than length of pectorals, and more than ½ length of head; anal spines present. Dark rusty brown, spotted or nearly plain. Young, olive brown, more or less spotted and blotched with reddish. Atlantic Coast of North America from Labrador to Chesapeake Bay. This small flounder is one of the most abundant of the group on our Atlantic coast. It reaches a length of about 15 inches and weighs less than 2 pounds. It is a good food fish.

Maryland localities: Anne Arundel, Calvert, Kent, Somerset, Dorchester, Talbot, St. Mary's and Worcester counties.

Family **Soleidæ**

AMERICAN SOLE; HOG CHOKER

Achirus fasciatus, (Lacépède)

Achirus fasciatus, Lacépède, Hist. Nat. Poiss., IV, 659, 662, 1803, Charleston, S. C., description based on the Linnæan account of the fish sent by Garden.

Body broad, regularly elliptical; mouth moderate, reaching just past front of lower eye. Eyes very small. Head 4; depth 1 4/5. Head and body scaled with strongly ctenoid scales, none of them with hair-like appendages. D. 46; A. 33; scales 70. Color dusky olive, more or less mottled and with about 8 dark vertical stripes. Vertebræ 8+20=28. South Atlantic and Gulf coast, from Cape Ann to Brazos Santiago, ascending sandy streams in shallow waters. Species is the best known of the American soles and is common along our coast. It seldom exceeds 5 or 6 inches in length. Is very little value as food on account of its small size.

Maryland localities: Anne Arundel, Baltimore, Calvert, Cecil, Charles, Harford, Prince Georges, St. Mary's and Worcester counties.

TONGUE FISH

Symphurus plagiusa, (Linnæus)

Pleuronectes plagiusa, Linnæus, Syst. Nat., ed. XII, 455, 1766, Charleston, S. C.

Differs from *Achirus fasciatus* in the long body, eyes and color on the left side, and caudal united with dorsal and anal. Reaches 7 inches.

Maryland localities: Dorchester county.

Family **Gobiesocidæ**

CLING FISH

Gobiesox strumosus, (Cope)

Gobiesox strumosus, Cope, Proc. Ac. Nat. Sci. Phila., 1870, 121, Hilton Head, South Carolina.

Head extremely wide, its width 2 5/6 in total length; this width partly produced by a large fleshy mass extending from end of maxillary to end of interopercle; eye small; profile of head descending abruptly from posterior line of orbits. Superior dental series twelve on each side, externally, but the three external teeth are a continuation; inferior teeth eleven on each side; four median incisors horizontal and subequal; no marked canine. Bluish plumbeous, fins blackish. Dorsal 11; Anal 10; C. 16; P. 21. Hilton Head, South Carolina, and Indian River, Florida.

Maryland localities: Chesapeake Bay and Worcester county.

Family **Gobiidæ**

NAKED GOBY

Gobiosoma bosc, (Lacépède)

Gobius bosc, Lacépède, Hist. Nat. Poiss., II, 555, pl. 16, fig. 1, 1798, Charleston, S. C.

Body elongate, head very broad, 3⅓; flattish above, with tumid cheeks. Depth 5 to 6. D. VII-14; A. 10. Eye very small. Mouth large. Teeth in a few

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series; two teeth on each side of inner series of lower jaw especially large canines. Dorsal spines slender; caudal rounded. Olivaceous with darker cross shades of rounded spots; vertical fins, dusky, faintly barred. Atlantic coast of the United States, Cape Cod to Florida; generally common, especially southward in shallow grassy bays.

Maryland localities: Anne Arundel, Calvert, Dorchester, Somerset, Harford, St. Mary's and Worcester counties.

SCALED GOBY

Microgobius culepis, (Eigenmann and Eigenmann)

Microgobius culepis, Eigenmann and Eigenmann, Proc. Cal. Acad. Sci., 1888, 69, Fortress Monroe, Va.

Body finely scaled. Mouth well inclined. Bands of immovable teeth in jaws. D. VII or VIII, 16 or 17; A. 17. Light blue. Length 2 inches.

Maryland localities: Calvert county.

Family **Uranoscopidæ**

THE STAR GAZER

Astroscopus guttatus, (Abbott)

Astroscopus guttatus, Abbott, Proc. Ac. Nat. Sci. Phila., 1860, 365, Cape May, New Jersey.

Depth 4 in length in young and 3¼ in adult. D. IV or V-13 or 14; A. 13; V. 1, 5. Eye 5½ in interorbital space. White spots on body very small and irregular, without dark rings. Color of upper parts of body and lower jaw bright chocolate; belly and throat white. Atlantic coast of the United States, from Long Island to Virginia; apparently scarce. Recorded from Cape May; Tompkinsville, New York; Norfolk, Va.; Somer's Point, N. J., etc. Not known south of Cape Hatteras.

Maryland localities: Lower Chesapeake Bay

Family **Batrachoididæ**

TOAD FISH

Opsanus tau, (Linnæus)

Gadus tau, Linn., Syst. Nat., ed. XII, 439, 1766, Charleston, S. C.

Body robust, naked, the head 2 2/3; depth 4⅓. D. III-26 to 28; A. 24. Mouth large, jaws very strong closing with great force; teeth blunt. Dusky olive with black markings confluent on the sides and forming irregular, indistinct bars. In specimens from shallow water the brown color becomes nearly black and more extended. In young individuals the head is more narrow and rounded. Cape Cod to Cuba; very abundant among rocks and weeds close to the shore northward, in deeper water southward; the young clinging to rocks by a ventral sucking disk which is soon lost. Length 15 inches. Not valued as food.

Maryland localities: Chesapeake Bay and its more salty tributaries. Worcester county.

Family **Blenniidæ**

FUCUS BLENNY

Blennius fucorum, (Valenciennes)

Blennius fucorum, Valenciennes, Hist. Nat. Poiss., XI, 263, 1836, 240 miles south of the Azores.

D. XI, 17; A. 18. Orbital cirri nearly as long as head, which is 5 in total length, bifid at tip, and fringed at the base. Dorsal fin slightly emarginate, free from the caudal, the spines rather stiff. Head very short and steep, its profile nearly vertical; 24 teeth in each jaw; each jaw with very strong canines; gill membranes free from the isthmus posteriorly. Olive green, becoming darker above, with numerous brown spots on the cheeks and sides of the body; below reddish; dorsal with a large black spot in front, behind which are smaller spots; spinous dorsal edged with paler. Open ocean in floating *Fucus;* the type from near the Azores; recorded by De Kay from the open seas, off New York, in floating seaweed.

Maryland localities: Somerset and Worcester counties.

LARGE-MOUTHED BLENNY

Chasmodes bosquianus, (Lacépède)

Blennius bosquianus, Lacépède, Nat. Hist. Poiss., II, 493, 1800 (female) S. C.

Head 3½; depth 3½. D. XI, 19; A. II, 19. Orbital tentacle very minute or wanting; maxillary extending to rather beyond eye; interocular space very narrow, not concave. Dorsal fin not emarginate, the spines slender. Dorsal joined to base of caudal; anal free. Color (in male) olive green, with horizontal blue lines, these somewhat irregular; opercular membrane and a broad stripe

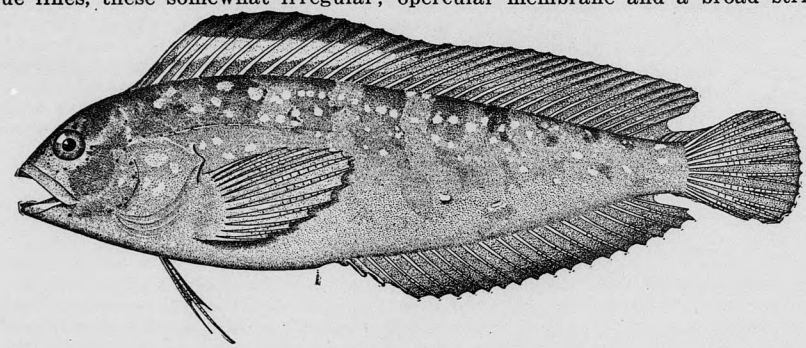

Fig. 62.—Chasmodes bosquianus

through middle of spinous dorsal, deep orange yellow; anal fin dark, the rays with white membraneous tips; female dark olive green, with narrow pale green lines and with several broad dark bars; vertical fins similarly marked; head finely dotted with black; a dusky spot at base of caudal in both sexes. New York to Florida; common southward in shallow water.

Maryland localities: Anne Arundel and St. Mary's counties.

Chasmodes quadrifasciatus, (Wood)

Pholis quadrifasciatus, Wood, Jour. Ac. Nat. Sci. Phila., IV, 1825, 282, location unknown, probably S. C.

D. 27; A. 15. Form of *Chasmodes bosquianus*. Lower jaw slightly longer than the upper. Dorsal and anal free from caudal; anal fin highest anteriorly. Body with four distinct brownish bands, a fifth broader and less marked on the neck; 4 round yellowish spots along base of anal; head spotted with blackish (Wood). Habitat uncertain, probably South Atlantic coast of the United States. Recent collectors do not recognize this form.

Maryland localities: St. Mary's county.

BLENNY

Hypsoblennius hentz, (Le Sueur)

Blennius hentz, Le Sueur, Journ. Acad. Nat. Sci. Phila., 4, 363, 1825, Charleston, S. C.

Differs from *Chasmodes* in the very blunt or obtuse head and a well developed tentacle over the eye. D. XII, 13 to 15; A. 17 to 19. Length 4 inches.

Maryland localities: Kent, Dorchester, Somerset and Calvert counties.

GUNNELL

Pholis gunnellus, (Linnæus)

Blennius gunnellus, Linn., Syst. Nat., ed. X, 257, 1758, Atlantic Ocean.

D. LXXVI to LXXXV; A. II, 38 to 44; V. I, 1; eye 5 in head. Head from 7 to 8 in body, compressed. Depth 7 to 8; maxillary 3; P. 2; C. 1 4/5. Mouth oblique, the maxillary reaching to front of pupil; teeth blunt in a single row, somewhat enlarged anteriorly; interorbital a narrow ridge about ½ eye. Distance from origin of dorsal to nape equal to distance from nape to middle of eye; pectoral rather large, about 2 in head, inserted directly under front of dorsal. Color olive brown, sides with numerous obscure darker bars; base of dorsal with blackish spots. Length 12 inches. North Atlantic from Labrador south to

Maryland and from Norway to France; abundant on rocky shores among algæ, both in America and Europe. Here described from specimens from Salem, Mass.

Maryland localities: Worcester county.

Family **Ammodytidæ**

SAND LAUNCE; SAND EEL; LANT

Ammodytes americanus, (De Kay)

Ammodytes americanus, De Kay, New York Fauna, Fishes, 317, 1842, Stratford, Connecticut.

Head 4¾; depth about 10. D. 60; A. 28. Pectoral fins much longer than snout, reaching front of dorsal. Lateral folds 125-130. Depth equal to length of mandible, which is 2⅓ in head. Olivaceous above, silvery below; sides with a steel blue stripe. Newfoundland to Cape Hatteras, abundant on sandy shores. Valuable as bait.

Maryland localities: Worcester county.

Family **Merlucciidae**

WHITING

Merluccius bilinearis, (Mitchill)

Stomodon bilinearis, Mitchill, Rep. Fishes New York, 7, 1814, New York.

Differs from the cods in the pike-like head, no barbels, ventrals normal, two dorsals of which second long. Reaches 2 feet.

Maryland localities: Dorchester county.

Family **Gadidæ**

COMMON CODFISH

Gadus callarias, (Linnæus)

Gadus callarias, Linnæus, Syst. Nat., ed. X, 252, 1758, young examples, Baltic Sea and oceans of Europe.

Head large, 3½ to 4½; depth about 4. D. 14, 21-19; A. 20-18. Maxillary reaching about middle of orbit; occipital keel not greatly developed; teeth strong, cardiform, in narrow bands, those of the outer row in the upper jaw, and of the inner row in the lower jaw somewhat enlarged. Eye moderate, about one-half length of snout. First dorsal little elevated; its height about one-half length of head; vent under front of second dorsal; caudal slightly emarginate; pectorals one-half length of head, yellowish or reddish; back and sides with numerous rounded brownish spots; lateral line pale; fins dark. North Atlantic, south to Virginia and France; one of the most important of food-fishes.

Maryland localities: Worcester county.

HADDOCK

Melanogrammus æglefinus, (Linnæus)

Gadus æglefinus, Linnæus, Syst. Nat., ed. X, 251, 1758, and ed. XII, 1766, 435, oceans off Europe.

D. 15-24-21; A. 23-21. Snout long and narrow, overlapping the small mouth. Head 3¾; depth 4½. Maxillary barely reaching front of orbit; teeth large, in a single series on lower jaw and on vomer; occiput carinated; a ridge extending backward from each orbit; eye very large, two-thirds length of snout, 4 in head. Dark gray above, whitish below. Lateral line black; a large dark blotch above the pectorals; dorsals and caudal dusky. North Atlantic on both coasts, south to France and N. C.; in deeper water to Cape Hatteras. An important food-fish, reaching a considerable size.

Maryland localities: Worcester county.

SPOTTED CODLING

Phycis regius, (Walbaum)

Blennius regius, Walbaum, Artedi Pisc., III, 186, 1792.

Body rather elongate, compressed. Head 4 1/5 in body; depth D. 8-43; A. 40; scales about 90; eye 4⅓ in head. Mouth large, the maxillary reaching slightly past posterior margin of eye; lower jaw included; cardiform teeth in jaws and vomer; interorbital flattish, about equal in width to the diameter of

eye; gill rakers short, 3+12 in number; origin of dorsal over base of pectorals; pectorals slender, barely reaching to front of anal; ventrals filamentous, composed of two rays each with the inner ray the larger, inserted in front of base of pectoral in distance equal to 1½ diameter of eye, their ends reaching nearly a head's length; caudal subtruncate. Pale brownish tinged with yellowish, the lateral line dark brown, interrupted by white spots; inside of mouth white; first dorsal largely black, this color surrounded by white; second dorsal olivaceous, with irregular round dark spots; caudal anal, and pectorals white; two vertical series of round dark spots on the sides of the head. North Atlantic, south to Cape Fear; ranging from shallow water to a depth of 167 fathoms.

Maryland localities: Kent and Queen Anne counties.

Family **Lophiidæ**

ANGLER

Lophius piscatorius, (Linnæus)

Lophius piscatorius, Linnæus, Syst. Nat., ed. X, i, 1758, 236, seas of Europe.

D. I-I-I, III-10; A. 9. Body depressed, tapering, scarcely longer than head. Humeral spine with three points, of which the posterior is the longest. Head surrounded with a fringe of barbels; top of head in young, with many strong spines. Anterior dorsal spine elongate, fleshy at tip. Brownish, mottled, below white; mouth behind the hyoid bone immaculate; pectorals and caudal black at tip; peritoneum black. Length three feet. North Atlantic on both coasts; generally common, ranging southward along the shore to Cape Hatteras; found in deep water as far south as Barbados, in 209 fathoms and to the Cape of Good Hope; northward to Norway and Nova Scotia. A well known fish of singular ugliness of appearance and of enormous voracity.

Maryland localities: Worcester county.

Family **Antennariidæ**

MOUSE FISH; SARGASSUM FISH

Pterophryne histrio, (Linnæus)

Lophius histrio, Linnæus, Syst. Nat., ed. X, 237, 1758, after various authors.

D. III-14; A. 7; V. 5. Head 2¼; depth 1 4/5. Skin of head and body as well as dorsal fins, with fleshy tags, which are most numerous on the dorsal spines and abdomen. Wrist slender; ventrals large, nearly one-half as long as head. Dorsal and anal with posterior rays not adnate to caudal peduncle; first dorsal spine bifurcate at tip. Yellowish, marbled with brown; three dark bands radiating from eye; vertical fins barred with brown; belly and sides with small white spots. Tropical parts of the Atlantic; abundant on our Gulf coast and occasional northward to Cape Hatteras or beyond, especially in floating masses of Sargassum. A remarkable fish, markedly variable in coloration.

Maryland localities: Oyster regions of Chesapeake Bay, according to Uhler and Lugger.

Family **Oncocephalidæ**

BAT FISH

Oncocephalus vespertilio, (Linn.)

Lophius vespertilio, Linn., Syst. Nat., ed. X, i, 236, 1758, American seas.

Head from tip of upper jaw to gill opening, nearly one-half the length; depth 5 in length from upper jaw to base of caudal; width 1 4/5. D. 4; A. 4; rostral process from 6 to 10 (9 in our specimens from Havana); P. 4½; V. 6; C. 4¼. Body stoutish, much depressed, rostral process longer than in the other species, variable in length; mouth small, the maxillary reaching nearly to posterior margin of eye; villiform teeth in bands, on jaws, vomer, and palatines; interorbital flattish, its width less between anterior edge of eyes than posterior edge; rostral groove longer than broad; body covered with bony protuberances, variable in size and not very definite in position, lower parts with a shagreen-like covering; posterior edge of pectorals much behind middle of body; ventrals long, reaching outward to edge of the disk-like, anterior part of body; origin of

dorsal over posterior edge of pectorals; anal under the vertical of tips of dorsal rays, reaching nearly to base of caudal. Pale grayish brown above, reddish below, back with round black spots conspicuous in life, but growing fainter and sometimes disappearing in spirits. Length 12 inches. West Indies, north to the Florida Keys; common in shallow water. Here described from a specimen from Havana, Cuba, about 10 inches in length.

Maryland localities: Uhler and Lugger report it from southern Chesapeake Bay as *Malthe vespertilio.*

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INDEX

COMMON AND SCIENTIFIC NAMES

	Page
Achirus fasciatus	107
Acipenser brevirostris	33
Acipenser sturio	33
Alectis ciliaris	69
Alewife	49
Alopias vulpes	29
Alosa sapidissima	50
Alutera schoepfii	101
Ameiurus catus	34
Ameiurus natalis	35
Ameiurus nebulosus	35
Ameiurus ponderosus	36
Amiatus calvus	34
Ambloplites rupestris	78
Ammodytes americanus	110
Anchovies	52
Anchovia epsetus	52
Anchovia mitchilli	52
Angel Fish	95
Angler	111
Anguilla rostrata	52
Apeltes quadracus	61
Aphredoderus sayanus	65
Archosargus probatocephalus	87
Astroscopus guttatus	108
Bachelor	75
Bairdiella chrysura	90
Balistes carolinensis	100
Barracuda, great	62
Barracuda, northern	68
Bass, calico	75
Bass, channel	90
Bass, large-mouthed black	77
Bass, rock	78
Bass, sea	84
Bass, small-mouthed black	76
Bass, striped	82
Bastard	88
Bat Fish	111
Bergall	94
Bitter Head	39
Black Will	84
Blennius fucorum	108
Blenny, common	109
Blenny, fucus	108
Blenny, large mouthed	109
Bluefish	71
Boleosoma longimanus	81
Boleosoma nigrum effulgens	81
Boleosoma nigrum olmstedi	81
Bonito	66
Bowfin	34
Bream, common	74
Bream, red eyed	78
Brevoortia, tyrannus	51
Bunker	51
Burr Fish	103
Butter Fish	72
Cabezon	90
Caranx crysos	69
Caranx hippos	68
Carassius auratus	44
Carcharias taurus	30
Carcharinus milberti	29
Carcharhinus obsurus	30
Carcharodon carcharias	29
Carp	44
Carp Sucker	45
Carpiodes cyprinus	45
Catfish, chuckle-headed	37
Catfish, horned pout, bull head	35
Catfish, mad tom	36
Catfish, Mississippi	36
Catfish, sea	34
Catfish, tadpole	36
Catfish, white, channel	34
Catfish, yellow	35
Catostomus commersonii	45
Centropristes striatus	84
Cephalacanthus volitans	98
Chaenobryttus gulosus	78
Chaetodipterus faber	95
Chasmodes bosquianus	109
Chasmodes quadrifasciatus	109

	Page
Chilomycterus schoepfi	103
Chrosomus, erythrogaster eos	37
Chub, Bermuda	88
Chub, nigger	44
Chub, river	43
Chub, silver	38
Clingfish	107
Clupea harengus	49
Codfish	110
Codling, spotted	110
Conger, conger	52
Cowfish	102
Crappie	75
Crab-eater	71
Crevalle	68
Croker	92
Cryprinodon variegatus	57
Cut-lips	44
Cyclopterus lumpus	99
Cynoscion nebulosus	89
Cynoscion nothus	88
Cynoscion regalis	89
Cyprinus carpio	44
Cypselurus heterurus	61
Dace, black-nosed	43
Dace, horned	38
Dace, long-nosed	43
Dace, pearl	39
Dace, red-bellied	37
Dace, rosy-sided	39
Darter, fan-tailed	82
Darter, Johnny	81
Darter, Olmsted's	81
Darter, shielded	80
Darter, tessellated	81
Dasyatis centrura	31
Dasyatis hastata	32
Dasyatis say	32
Diodon hystrix	103
Dogfish	28
Dorosoma cepedianum	48
Drum, black	94
Drum, red	90
Echeneis naucrateoides	100
Echeneis naucrates	99
Eel, conger	52
Eel, lamprey	27
Eel, sand	110
Eel, common, true	52
Elops, saurus	47
Enneacanthus gloriosus	73
Enneacanthus obesus	72
Ericymba buccata	43
Erimyzon sucetta oblongus	46
Escribano, Balao, half beak	60
Esox americanus	54
Esox reticulatus	54
Etheostoma flabellare	82
Etrumeus teres	49
Exoglossum maxillingua	44
Fair Maid	86
Felichthys marinus	34
File Fish, Fool Fish	101
File Fish, Massachusetts	101
Flatfish, common	107
Flounder, four-spotted	105
Flounder, summer	105
Flounder, winter	107
Fluke	106
Flying Fish	60
Fundulus diaphanus	56
Fundulus heteroclitus	55
Fundulus luciae	57
Fundulus majalis	54
Gadus callarias	110
Galeocerdo tigrinus	28
Gambusia affinis	58
Gar, silver	61
Ginglymostoma cirratum	29
Globe Fish	102
Gobiesox strumosus	107
Gobiosoma bosci	107
Goby, naked	107
Goby, scaled	108
Goldfish	44
Grunt, common	85
Gunnell	109
Gurnard, common	96
Gurnard, southern, striped	97
Haddock	110
Hadropterus peltatus	80
Haemulon plumieri	85
Halibut	106
Hard Head	92
Harvest Fish	72
Hemiramphus brasiliensis	60
Hemitripterus americanus	98

	Page
Herring, branch	49
Herring, common	49
Herring, glut	50
Herring, round	49
Herring, thread	51
Hiodon tergisus	48
Hippocampus hudsonius	59
Hippoglossus hippoglossus	106
Hog Choker	107
Horsefish	69
Horsehead	70
Hound Fish	62
Hybognathus nuchalis	37
Hybopsis kentuckiensis	43
Hypentelium nigricans	47
Hyporhamphus unifasciatus	60
Hypsoblennius hentz	109
Ictalurus punctatus	37
Ictalurus furcatus	37
Ide, golden	45
Idus idus	45
Jugfish	102
Killifish, barred	56
Killifish, brown	57
Killifish, common	55
Killifish, rock	54
King Fish	93
Kirtlandia vagrans	63
Kyphosus sectatrix	88
Lactophrys tricornis	102
Lactophrys trigonus	102
Lagocephalus laevigatus	102
Lagodon rhomboides	86
Lampetra lamottenii	27
Lamprey, brook	27
Lamprey, sea	27
Larimus fasciatus	90
Launce, sand	110
Leather Jacket	100
Leiostomus xanthurus	91
Lepisosteus osseus	33
Lepomis auritus	73
Lepomis cyannellus	74
Lepomis gibbosus	74
Leuciscus margarita	39
Leuciscus vandoisulus	39
Limanda ferruginea	106
Lizard Fish	53
Lobotes surinamensis	84
Lophius piscatorius	111
Lophopsetta maculata	104
Lucania parva	57
Lump Fish	99
Mackerel, chub	66
Mackerel, common	65
Mackerel, horse	66
Mackerel, Spanish	67
Mackerel, yellow	69
Mad Tom	36
Manta	33
Manta birostris	33
Megalops atlanticus	48
Menhaden	51
Melanogrammus aeglefinus	110
Menidia beryllina	63
Menidia notata	64
Menticirrhus americanus	93
Menticirrhus saxatilis	93
Merluccius bilinearis	110
Mesogonistius chaetodon	73
Microgobius eulepis	108
Micropogon undulatus	92
Micropterus dolomieu	76
Micropterus salmoides	77
Minnow, attractive	42
Minnow, blunt-nosed	37
Minnow, bridled	40
Minnow, emerald	42
Minnow, iron-colored	42
Minnow, long-nosed	43
Minnow, mud	54
Minnow, scalloped	43
Minnow, sheepshead	57
Minnow, silvery	37
Minnow, swallow	40
Minnow, top	58
Minytrema melanops	47
Mola mola	103
Monacanthus hispidus	101
Moon-eye	48
Moon-fish	69
Morone americana	83
Mouse Fish	111
Moxostamo macrolepidotum	47
Mugil cephalus	64
Mugil curema	64
Mullet, common	64

	Page
Mullet, red-horse	47
Mullet, white	64
Mustelus canis	29
Myliobatis freminvillei	32
Needlefish	61
Notemigonus crysoleucas	39
Notropis amoenus	42
Notropis analostanus	41
Notropis atherinoides	42
Notropis bifrenatus	40
Notropis chalybaeus	42
Notropis cornutus	41
Notropis hudsonius amarus	40
Notropis procne	40
Oncocephalus vespertilio	111
Opisthonema oglinum	51
Opsanus tau	108
Oyster Fish	94
Paralichthys dentatus	105
Paralichthys oblongus	105
Parrot Fish, blue	95
Pega	99
Perca flavescens	79
Perch, blue	94
Perch, King William	90
Perch, log	80
Perch, pike	79
Perch, pirate	65
Perch, trout	65
Perch, white	83
Perch, yellow	79
Percina caprodes	80
Percopsis guttatus	65
Petromyzon marinus	27
Pholis gunnellus	109
Phycis regius	110
Pickerel, common	54
Pickerel, eastern	54
Pike, common	54
Pike, gar	33
Pike, green	54
Pike, wall-eyed	79
Pilot Fish	100
Pimephales notatus	37
Pin Fish	86
Pintado	67
Pipefish, common	59
Pipefish, Louisiana	59
Pipefish, Florida	59
Pogonias cromis	94
Pogy, yellow tail	51
Pomatomus saltatrix	71
Pomolobus aestivalis	50
Pomolobus mediocris	49
Pomolobus pseudoharengus	49
Pomoxis annularis	75
Pomoxis sparoides	75
Pompano, round	70
Pompano, common	70
Porcupine, sea	103
Porgy	80
Poronotus triacanthus	72
Prionotus carolinus	96
Prionotus evolans	97
Pristis pectinatus	27
Pterophyrne histrio	111
Pteroplatea maclura	32
Pseudopleuronectes americanus	107
Puffer, common	102
Puffer, smooth	102
Pumpkin-seed	74
Rachycentron canadum	71
Rainwater fish	57
Raja eglanteria	30
Raja erinacea	30
Raja laevis	31
Ray, butterfly	32
Ray, common	31
Ray, cow-nosed	33
Ray, eagle	32
Ray, Southern, sting	32
Red-eye	78
Remora remora	100
Rhinichthys atronasus	43
Rhinichthys cataractae	43
Rhinoptera bonasus	33
Rhombochirus osteochir	100
Roach	39
Robin, flying	98
Robin, red-winged	96
Roccus lineatus	82
Rock	82
Rudder Fish	68
Salvelinus fontinalis	53
Sand Dab, Fluke	106
Sand Roller	65
Sarda sarda	66

	Page
Saury	61
Sawfish	27
Scarus caeruleus	95
Sculpin, fresh-water	98
Schilbeodes insignis	36
Schilbeodes gyrinus	36
Sciaenops ocellatus	90
Scomber colias	66
Scomber scombrus	65
Scomberomorus maculatus	67
Scomberomorus regalis	67
Scombresox saurus	61
Scup, common	86
Sea Devil	33
Sea Horse	59
Sea Raven	98
Sea Robin, red-winged	96
Sea Trout, common	89
Sea Trout, spotted	89
Selene vomer	70
Semotilus atromaculatus	38
Semotilus bullaris	38
Seriola zonata	68
Seserinus paru	72
Shiner, red-fin	41
Shad, common	50
Shad, gizzard	48
Shad, hickory	49
Shark, angel	28
Shark, dog	29
Shark, dogfish	28
Shark, dusky	30
Shark, hammer-headed	28
Shark, great white	29
Shark, Milbert's	29
Shark, nurse	29
Shark, sand	30
Shark, thresher	29
Shark, tiger	28
Shark's Pilot	68
Shark-sucker	99
Sheepshead	87
Short Head	103
Sierra	67
Silver-fin	41
Silverside, marine	64
Silverside, fresh-water	63
Silverside, rough	63
Skate, barn-door	31
Skate, briar	30
Skate, common	30
Skipjack	71
Skipper	61
Sole, American	107
Spade Fish	95
Spawn-eater	40
Spearfish sucker	100
Sphyraena barracuda	62
Sphyraena borealis	62
Sphyrna zygaena	28
Spot	91
Squalus acanthias	28
Squatina dumeril	28
Squeteague	89
Star Gazer	108
Stenotomus chrysops	86
Stickleback, four spined	61
Sting Ray	32
Stingaree	31
Stizostedion vitreum	79
Strongylura acus	62
Strongylura marina	61
Sturgeon, common	33
Sturgeon, short-nosed	33
Sucker, black	47
Sucker, chub	46
Sucker, common or brook	45
Sucker, eastern carp	45
Sucker, red-horse or mullet	47
Sucker, spotted	47
Sunfish, black-banded	73
Sunfish, blue-spotted	73
Sunfish, common	74
Sunfish, green	74
Sunfish, ocean	103
Sunfish, sphagnum	72
Sunfish, yellow belly	73
Swell Fish	102
Swordfish, common	68
Symphurus plagiusa	107
Syngnathus fuscus	59
Syngnathus louisianae	59
Syngnathus floridae	59
Synodus foetens	53
Tambor	102
Tautoga onitis	94
Tautogolabrus adspersus	94
Tarpon	48
Tautog	94
Tench	44
Ten-pounder	47

	Page
Tetrodon maculatus	102
Tetrodon testudineus	102
Tinca tinca	44
Thunnus thynnus	66
Thread Fish	69
Toad Fish	108
Tongue Fish	107
Toro	68
Torpedo	31
Torpedo nobiliana	31
Trachinotus carolinus	70
Trachinotus falcatus	70
Trigger Fish	100
Triple-tail	84
Trout, brook or speckled	53
Trout, sea	89
Trunk Fish	102
Umbra pygmaea	54
Uranidea gracilis	98
Urophycis regius	61
Vomer setapinnis	69
War-mouth	78
Weak Fish, bastard	88
Weak Fish, common	89
Weak Fish, spotted	89
Window Pane	104
Whiting, common	110
Whiting, carolina or sand	93
Xiphias gladius	68
Yellow-tail	90